CommSync II Family
Option Modules
User's Manual

Document 385-8003
Revision AJ

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08/01/05	Rev S: Changed lower frequency limit of N.1 module.
10/14/05	Rev T: Added 385-4033-05, 50 PPS Output module.
11/07/05	Rev U: Added 385-4010-06, 10V 1 PPS Output module.
12/15/05	Rev V: Corrected Spec level 385-4020 modules
02/11/06	Rev W: Added 385-4087, Dual NTP Module.
03/07/06	Rev Y: Corrected Configuration information for 385-4087, Dual NTP Module.
06/01/06	Rev Z: Added missing Ethernet Module information.
07/31/06	Rev AA: Corrected information for Ethernet I/O Modules
08/24/06	Rev AB: Added IRIG B126/127 selection to 385-4020 description
09/07/06	Rev AC: Corrected description for NTP (per RFC), added resolution for 385-4039 modules, Added missing documentation on 385-4047-05.06 modules. Added control slot information for GSyncII and CommSyncII-D.
04/20/07	Rev AD: Added 385-4010-07 10V 1PPM Output Module and 385-4067-03 100KHz/1MHz/2x5MHz Module.
05/04/07	Rev AE: Added 385-4090-xx Dual Port Ethernet Module.
02/06/08	Rev AF: Updated FEI-Zyfer address.
03/27/08	Rev AG: Corrected the address for FEI-Zyfer support web page.
04/01/08	Rev AH: Added 385-4070-03 Have-Quick V.11 Output Module
04/23/08	Rev AJ: Updated the part numbers of Time Code Modules to 385-4020-11,12,13 from 385-4020-01,02,03

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- Increase the separation between the equipment and the receiver
- Connect the equipment into a outlet on a circuit different from that to which the receiver is connected.

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Introduction

This manual is designed to provide information on removal and installation of the modules as well as the operation, configuration, and specifications for each available option modules for the CommSyncII family systems. Except where noted, the modules may be used in either system. Commands specific to the module are listed. Refer to the Serial Communication Protocol document, 385-8002, for more information on these commands.

For additional information on the CommSyncII family Systems refer to the Users Manuals: CommSyncII (385-8000), CommSyncII-D (407-8000), GSync (391-8000) or the GSyncII (402-8000).

Removal/Installation Instructions

All modules are designed to be hot-swappable. It is not necessary to remove power from the system before removing or installing an option module. The only exception to this is a non-redundant power supply module (385-4021, 385-4022, or 385-4042). If there are two power supplies installed, either power supply is hot-swappable.

To remove a module, loosen the retaining screws on the top and bottom and pull the module out of the chassis. Other functions of the CommSyncII, CommSyncII-D, GSync or GSyncII systems should not be interrupted.

Some modules may need to be configured prior to installation. The modules requiring prior configuration are the Time Code Output Module (385-4020), the T1/E1 Output Module (385-4034), and the Pulse Rate Output Module (385-4033-02). In these cases, configure the module per the instructions in the section pertaining to that module. All other modules require no configuration, or are configured via serial command.

To install a module, line up the circuit card with the guide rails and slide the module into place. When seated, it will power up and begin normal operation. Tighten the retaining screws on the top and bottom of the module.

The modules requiring additional configuration (for example, a Clock Rate Module or the time offset of a Time Code Module), may be accomplished by following the instructions for the module in the module description.

Important Note Unless otherwise noted: Slot numbers/Control and Power slots,:

For a CommSyncII system, modules may be installed in slots 3 through 15. Power Supplies must be installed in slots 1 and/or 16. I/O Modules must be installed in Slot 15 (Primary slot) and Slot 14 (Secondary slot). In

For a CommSyncII-D system, modules may be installed in slots 1 through 8. Power Supplies must be installed in slots 0 and/or 9. I/O Modules must be installed in Slot 8 (Primary slot) and Slot 7 (Secondary slot).

For a GSync system, modules may be installed in slots 1 through 4. If an I/O Module is used, it must be installed in Slot 4.

For a GSyncII system, modules may be installed in slots 1 through 8. If an I/O Module is used, it must be installed in Slot 8.

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Section 1 I/O CONTROL MODULES

This section provides information on I/O Modules. There are currently four I/O Modules available. There are two RS-232 I/O Modules and two Ethernet I/O Modules.

RS-232 I/O Modules

The RS-232 I/O Modules both provide for serial communication via the DE9 connector:

The 385-4005-01 has two BNC connectors, providing a 1 PPS test output.

The 385-4037 is designed for external synchronization input for DTF systems. The 385-4037 is available in two input configurations:

The 385-4037-02 has two BNC connectors to receive 0.7 Vpp to 10 Vpp sine or square wave reference inputs from the user for DTF-based systems.

The 385-4037-03 has two fiber optic (ST) connectors to receive optical inputs.

The 385-4040 receives IRIG time to set the system time and external synchronization input for the DTF system.

Ethernet I/O Modules

The Ethernet I/O Modules both provide for communication via TCP/IP, and for TELNET. In addition, both are capable of providing network time service (NTS) with NTP time.

The 385-4024-01 provides 10BaseT TCP/IP Telnet and NTP access, as well as BNC TTL 1 PPS test outputs.

The 385-4038 provides an auto selectable 10/100BaseT interface for TCP/IP Telnet, NTP, and SNMP access. The 385-4038 is available in three configurations:

The 385-4038-01 has, in addition to the standard RJ-45 connection, an additional RS-232 port connection for serial communication via RS-232.

The 385-4038-02 has two BNC connectors to receive 0.7 Vpp to 10 Vpp sine or square wave reference inputs from the user for DTF-based systems.

The 385-4038-03 has two fiber optic (ST) connectors to receive optical inputs for DTF-based systems.

The 385-4090 provides two auto selectable 10/100BaseT interfaces for TCP/IP Telnet, NTP, and SNMP access. The 385-4090 is available in three configurations:

The 385-4090-01 has, in addition to the standard RJ-45 connection, an additional RS-232 port connection for serial communication via RS-232.

The 385-4090-02 has two BNC connectors to receive 0.7 Vpp to 10 Vpp sine or square wave reference inputs from the user for DTF-based systems.

The 385-4090-03 has two fiber optic (ST) connectors to receive optical inputs for DTF-based systems.

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RS-232 I/O Module 385-4005-01

The RS-232 I/O Module provides a bi-directional RS-232 interface for remote control and monitor of the system.

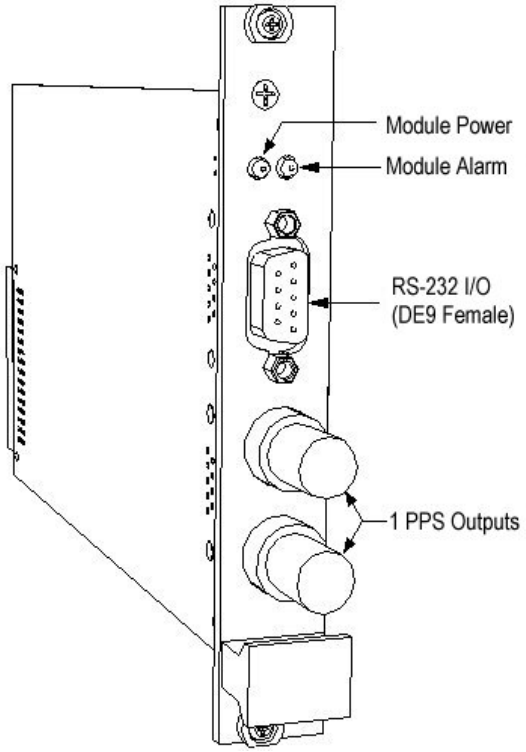
The CommSyncII System accepts an I/O Module in ether Slot 15 (Primary) or Slot 14 (Secondary). The CommSyncII-D will accept an I/O module in either Slot 8(Primary) or Slot 7(Secondary). The Primary slot communicates directly with the online GTF module, while the Secondary slot communicates directly with the offline (redundant) GTF module. The GSync system accepts the Module in Slot 4, and the GSyncII accepts the Module in Slot 8.

The RS-232 I/O Module has two status LEDs, a 9-pin D-Subminiature connector and two BNC connectors. The D-Subminiature connector contains one RS-232 bi-directional serial port and two hardware status output signals, Alarm and Ready. Each BNC connector provides a TTL 1 PPS output, used for test purposes. The module is "hot swappable". It can be removed or installed without removing power from the CommSync II System or interrupting operations.

1.1 LED Status Indicators

The module's LEDs indicate the status of the module.

- The Green LED indicates power to the module.
- The Red LED is the Alarm indicator that illuminates when there is a fault on the module.

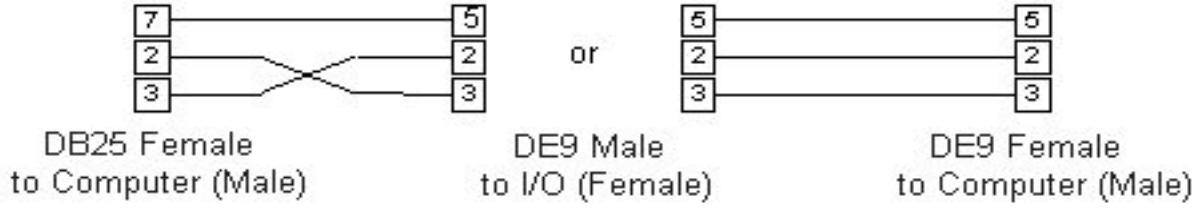


1.2 Connecting the Control/Monitor Port

Remote control and monitor of the system's operation is accomplished through an RS-232 interface. Connect the remote control/monitor device to the system's rear panel D-Subminiature connector as follows:

CONNECTOR PIN DESIGNATION		
PIN	SIGNAL	DESCRIPTION
1	+5V (source)	+5 VDC
2	OUTPUT (TXD)	RS-232 OUTPUT
3	INPUT (RXD)	RS-232 INPUT
4	ALARM	Alarm output
5	RTN	Signal Ground
6		NO CONNECTION
7		NO CONNECTION
8	READY	Ready output
9	RTN	Signal Ground

Note: The required mating connector is a 9-contact male "D-Subminiature" connector.



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1.3 Status

The status of the RS-232 I/O Module can be obtained from the GTF module SSTA message or viewed from the Front Panel display (Menu 8). The status message consists of an identification number (first byte) in hex format and a bus status message (second byte).

1.3.1 Status Message

ID	Status
0x0A	Bus Status: Bit0=/online1, Bit1=/ready1, Bit2=fault1, Bit4=/online2, Bit5=/ready2, Bit6=fault2

1.3.2 Front Panel Display (Example)

1.3.3 Commands

There are no commands specific to the RS-232 I/O Module.

1.4 Alarm Status

The DE9 connector serves as the RS-232 interconnection as well as providing two additional alarm outputs. These outputs are open collector outputs and will be open in the case of an alarm indication.

The Alarm output at pin 4 (refer to Connector Pin Designation on page 10) will be open if either GTF/DTF is faulted. Faults would include a power fault, 10 MHz output fault, 1 PPS fault, or a failure to communicate with the GPS receiver. In addition, if one of the GTF/DTF modules is removed, a fault will be indicated.

The Ready output at pin 9 will be open if neither GTF/DTF is Ready.

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1.5 Specifications

All I/O interface and status signals are available on the module's D-Subminiature connector.

Connector Type ..... 9-contact female D-Subminiature

1.5.1 I/O Interface

Output (TXD) ..... Pin 2
Input (RXD) ..... Pin 3
Signal Return ..... Pin 5
Signal Levels ..... RS-232 compatible
Baud Rate 19200
Data Bits 8
Stop Bits 1
Parity ..... None
Command Protocol ..... Per FEI-Zyfer Document 385-8002

1.5.2 Hardware Status Output

In addition to the I/O interface signals, two open collector output signals are provided to indicate system status. These signals require an external pull up resistor, and are pulled to ground potential when the system is in the Ready mode, and when no alarms are present. The outputs become high impedance when the system is not ready, and when there is an alarm condition.

Pin 1 Function ..... +5 VDC, 50 mA maximum
(for use with external indicators or relays)
Pin 4 Function ..... No Alarm = "On"
Alarm = "Open Circuit"
Pin 8 Function ..... System Ready = "On"
System not Ready = "Open Circuit"
"On" Sink Current ..... 100 mA maximum
"On" Voltage ..... +0.3 VDC maximum
Open Circuit Voltage ..... +30 VDC maximum
Reverse Voltage ..... -2 VDC maximum

1.5.3 1 PPS Output

Number of Ports 2
Connector Type ..... BNC female
Rate ..... 1 PPS
Wave Shape ..... Pulse
Pulse Width ..... 2 mS
Synchronization Reference ..... UTC
Synchronization ..... Rising (leading) edge on-time
Output Drive
High Level ..... $\geq$ +2.0 V into 50 Ω load
($\geq$ 3.0 V open circuit)
Low Level ..... $\leq$ +0.5 V into 50 Ω load
Source Impedance ..... 50 Ω nominal
Protection ..... Short circuit proof

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RS-232 I/O External Input Module 385-4037

The RS-232 I/O External Input Module provides a bi-directional RS-232 interface for remote control and monitor of the system and connections for external synchronization input.

The CommSyncII System accepts an I/O Module in ether Slot 15 (Primary) or Slot 14 (Secondary). The CommSyncII-D will accept an I/O module in either Slot 8(Primary) or Slot 7(Secondary). The Primary slot communicates directly with the online GTF module, while the Secondary slot communicates directly with the offline (redundant) GTF module. The GSync system accepts the Module in Slot 4, and the GSyncII accepts the Module in Slot 8.

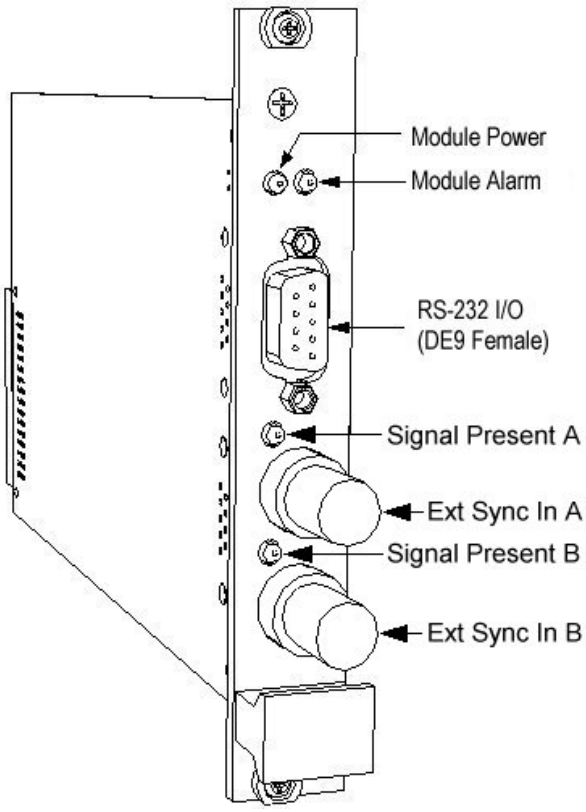
The module has four status LED's, a 9-pin D-Subminiature connector and two BNC or fiber optic connectors. The D-Subminiature connector contains one RS-232 bi-directional serial port and two hardware status output signals, Alarm and Ready, and Lock inputs.

Each BNC or fiber optic connector accepts synchronization input signals to discipline the DTF oscillator. The module is "hot swappable". It can be removed or installed without removing power from the CommSync II System or interrupting operations.

1.1 LED Status Indicators

The module's LEDs indicate the status of the module.

- The Green LED indicates power to the module.
- The Red LED is the Alarm indicator that illuminates when there is a fault on the module.
- Two Green LEDs illuminate when there is a sync signal present at their respective inputs.



1.2 Module Configurations

Two configurations for the RS-232 I/O External Input Module are available. Both provide for the RS-232 I/O functions via the 9-pin female connector. The following matrix indicates which dash number, its synchronization input signal, and the type of connectors used:

Part Number	Synchronization Input	Connector
385-4037-02	1 PPS, 1 MHz, 5 MHz, 10 MHz	2 x BNC
385-4037-03	1 MHz, 5 MHz, 10 MHz	2 x F.O.

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1.3 Connecting the Control/Monitor Port

Remote control and monitor of the system's operation is accomplished through an RS-232 interface.

Connect the remote control/monitor device to the system's rear panel D-Subminiature connector as follows:

CONNECTOR PIN DESIGNATION		
PIN	SIGNAL	DESCRIPTION
1	+5V (source)	+5 VDC
2	OUTPUT (TXD)	RS-232 OUTPUT
3	INPUT (RXD)	RS-232 INPUT
4	ALARM	Alarm output
5	RTN	Signal Ground
6	External Input B LOCK (optional)	Open Collector input pulled up 100K Ω
7	External Input A LOCK (optional)	Open Collector input pulled up 100K Ω
8	READY	Ready output
9	RTN	Signal Ground

1.4 Status

The status of the RS-232 I/O External Input Module can be obtained from the GTF module SSTA message or viewed from the Front Panel display (Menu 8). The status message consists of an identification number (first byte) in hex format and a bus status message (second byte).

1.4.1 Status Message

The status message consists of an identification number (first byte) in hex format and a status message (second byte).

ID	Status
0x0B	Bit 7 = System Fault Bit 6,5 = DTF Select (00 = None, 01 = #1, 10 = #2, 11 = Both) Bit 4 = Input Select (A = 0, B = 1) Bit 3 = Ext. Input B Present Bit 2 = Ext. Lock B Present Bit 1 = Ext. Input A Present Bit 0 = Ext. Lock A Present

1.4.2 Front Panel Display

Two displays relate to the RS-232 I/O External Input Module. One is the standard Module Status display located in Menu 8. The following picture is an example of how the display will appear:

```
Slot 15 RS-232 Ext Input Module   0x0B ≡
Status: 0x1A
```

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Menu 7 provides for front panel controls of Slots 15 (primary) and 14 (secondary):

```
Primary CTL (Slot 15)     Ext In: 10MHz≡
Input: AUTO  To:  BOTH      Status: 0x00
```

1.4.3 Commands

The INPC command is used to set the module for input (A, B, or both) and to which DTF the synchronization signal is being sent. See the protocol document 385-8002 for further information.

1.4.4 External Synchronization Inputs

The DTF module requires an external synchronization input as a reference source to discipline the internal oscillator. The two input connectors (A and B) provide redundant input capability. The automatic input switch monitors each input (presence detector) and can automatically switch to the other input in the event of a failure.

Note: Both inputs must be the same frequency, and the input frequency must have an error of less than 1E-10 for Rubidium-systems (385-4060-01) and less than 1E-9 for Crystal-based systems (385-4060-02) for the internal oscillator to be able to accurately synchronize to the input.

An optional lock input (from an external oscillator lock indicator) can also control the input switch. The default configuration of the lock input is set to override.

1.5 Alarm Status

The DE9 connector serves as the RS-232 interconnection as well as providing two additional alarm outputs. These outputs are open collector outputs and will be open in the case of an alarm indication.

The Alarm output at pin 4 (refer to Connector Pin Designation on page 15) will be open if either GTF/DTF is faulted. Faults would include a power fault, 10 MHz output fault, 1 PPS fault, or a failure to communicate with the GPS receiver. In addition, if one of the GTF/DTF modules is removed, a fault will be indicated.

The Ready output at pin 9 will be open if neither GTF/DTF is Ready.

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1.6 Specifications

1.6.1 RS-232 I/O Interface

Connector Type ..... 9-contact female D-Subminiature
Output (TXD) ..... Pin 2
Input (RXD) ..... Pin 3
Signal Return ..... Pin 5
Signal Levels ..... RS-232 compatible
Baud Rate 19200
Data Bits 8
Stop Bits 1
Parity ..... None
Command Protocol ..... Per FEI-Zyfer Document 385-8002

1.6.2 Hardware Status Output

In addition to the I/O interface signals, two open collector output signals are provided to indicate system status. These signals require an external pull up resistor, and are pulled to ground potential when the system is in the Ready mode, and when no alarms are present. The outputs become high impedance when the system is not ready, and when there is an alarm condition.

Connector Type ..... (part of the 9-contact female D-Subminiature)
Pin 1 Function ..... +5 VDC, 50 mA maximum
Pin 4 Function ..... No Alarm = “On”, Alarm = “Open Circuit”
Pin 8 Function ..... System Ready = "On", System not Ready = "Open Circuit"
Circuit Type ..... Open collector NPN transistor
"On" Sink Current ..... 100 mA maximum
"On" Voltage ..... +0.3 VDC maximum
Open Circuit Voltage ..... +30 VDC maximum
Reverse Voltage ..... -2 VDC maximum

1.6.3 Module Specifications

385-4037-02 (1 PPS input) Synchronization Inputs (Ext Sync A/B)

Connector Type ..... BNC female
Number of Inputs ..... 2 (A and B inputs)
Input Frequency ..... 1 PPS
Minimum Input Pulse Width ..... 10 μS
Input Signal Amplitude ..... 1 to 5 Vpp
Input Stability ..... $\leq$ 1E-10 (w/Rb DTF)
$\leq$ 1E-9 (w/Xtal DTF)
$\leq$ 1E-8 (w/VXCO DTF)
Trigger ..... Rising edge
Input Impedance ..... > 100K Ω

Note: For 1 PPS input an external termination (50 Ω) is required.

The default setup will discipline the oscillator on the rising edge of the 1 PPS input. If falling edge synchronization is required, remove the module, remove the shunt at JP1, and reinstall the module.

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385-4037-02 Frequency inputs (Ext Sync A/B)

Connector Type	BNC female
Number of Inputs	2 (A and B inputs)
Input Frequency	1 MHz, 5 MHz, or 10 MHz
Input Signal Type	Square or Sine Wave
Input Signal Amplitude	0.5 Vpp to 10 Vpp
Input Accuracy Error	≤ 1E-10 (Rb DTF)
	≤ 1E-9 (Xtal DTF)
	≤ 1E-8 (VXCO DTF)
Input Impedance	> 100K Ω

Note: For square wave input an external termination (50 Ω) is required.

385-4037-03 (Fiber-Optic, Frequency input only)

Connector Type	ST
Number of Inputs	2 (A and B inputs)
Input Frequency	1 MHz, 5 MHz, 10 MHz
Input Signal Type	Square Wave or Pulse
Input Signal Amplitude	-8 to -22 dBm
Input Accuracy Error	≤ 1E-10 (Rb DTF)
	≤ 1E-9 (Xtal DTF)
	≤ 1E-8 (VXCO DTF)
Wavelength	850 nm
Fiber Cable	Multimode 50/125 or 62.5/125

385-4037-02, -03 (Optional Ext Lock input)

Connector Type	(part of 9-contact female D-Subminiature)
Pin 7 Function	"A" Input Locked input
	Open Circuit indicates External Source is locked
	Closed Circuit (tied to Signal Common) indicates External Source not locked
Pin 6 Function	"B" Input Locked input
	Open Circuit indicates External Source is locked
	Closed Circuit (tied to Signal Common) indicates External Source not locked
Pin 9 Function	Signal Common (Chassis rtn)
Circuit Type	Open Collector Type Input
"On" (closed circuit) Sink Current	20 mA typical (100K Ω pull up to +5V)
"Off" (open circuit) Voltage	+5.0 VDC maximum
Reverse Voltage	-1 VDC maximum

To invert the functionality of the LOCK signal (so that closed circuit indicates lock), remove the module, install a shunt at JP2, and reinstall the module.

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Time Code Input Module 385-4040

The 385-4040-01 Time Code Input Module has connections for IRIG-B input (time information), and connections for external synchronization input. The IRIG-B input is used to set time in the DTF module. The synchronization input signals are used to discipline the DTF. The 385-4040-03 Time Code Input Module has connections for IRIG-B input (time information), and connections for a RS-232 serial command port

The CommSyncII System accepts an I/O Module in ether Slot 15 (Primary) or Slot 14 (Secondary). The CommSyncII-D will accept an I/O module in either Slot 8(Primary) or Slot 7(Secondary). The Primary slot communicates directly with the online GTF module, while the Secondary slot communicates directly with the offline (redundant) GTF module. The GSync system accepts the Module in Slot 4, and the GSyncII accepts the Module in Slot 8.

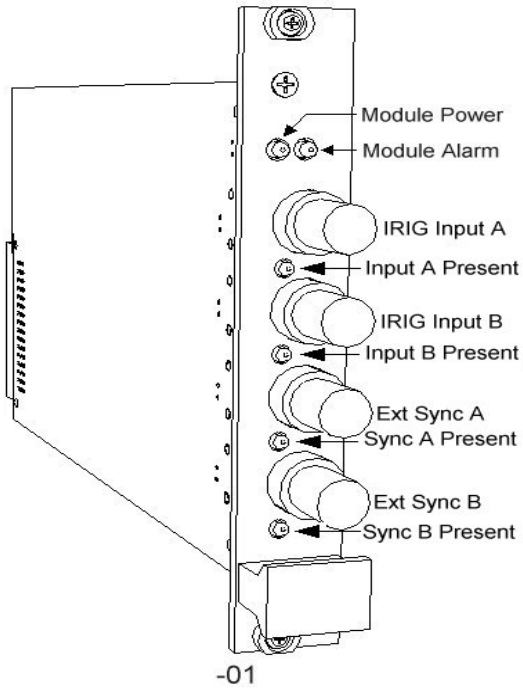
The 385-4040-03 module may also be used in conjunction with the 385-4038-02 or -03 Ethernet input module, when installed in an adjacent slot.

The module is “hot swappable”. It can be removed or installed without removing power from the CommSync II System or interrupting operations.

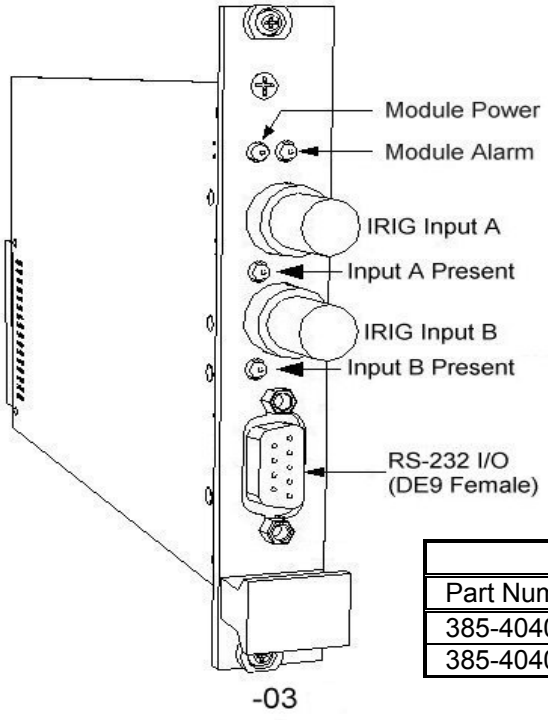
1.1 LED Status Indicators

The module’s LEDs indicate the status of the module.

- The Green LED indicates power to the module.
- The Red LED is the Alarm indicator that illuminates when there is a fault on the module.
- Green LEDs at each input connector illuminate when there is a signal present at their respective inputs.



-01



-03

Module Configuration

The following table includes the signal inputs and connection type.

Time Code Input Module Configurations				
Part Number	A	B	C	D
385-4040-01	IRIG: BNC	IRIG: BNC	EXT: BNC	EXT: BNC
385-4040-03	IRIG: BNC	IRIG: BNC	RS-232: DE9	

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1.2 IRIG input and Ethernet Input module combination

The 385-4040-03 may be used with the Ethernet Input Module (385-4038-02 or -03). In this configuration the module will be installed in the adjacent slot and connected via a supplied ribbon cable. As an example: In a CommSyncII application, the Ethernet Input Module will be installed slot 15, with the Time Code Input Module will installed in slot 14 (with a ribbon cable between), or in a GSync application, the Ethernet I/O Module in slot 4, with the Time Code Input Module in slot 3 (with the ribbon cable). The two modules work together in providing I/O for the command interface as well as synchronization and IRIG time inputs.

To install a 385-4040-03, it is necessary to connect the supplied ribbon cable from J9 on the module to J2 on the Ethernet I/O Module in the Primary slot. This provides the I/O path for the RS-232 and IRIG time set functions.

1.3 Input Code Type

Each IRIG input connector is user-configurable via jumper plugs to allow for either Amplitude Modulated or DC-Shift code inputs. The default setting is for Amplitude Modulated on both inputs. For DC-Shift code inputs on either input see Figure 1 for shunt locations. IRIG inputs A and B are auto select (A priority) only.

The two input connectors (A and B) provide redundant IRIG input capability. The automatic input switch monitors each input (presence detector) and can automatically switch to the other input in the event of a failure.

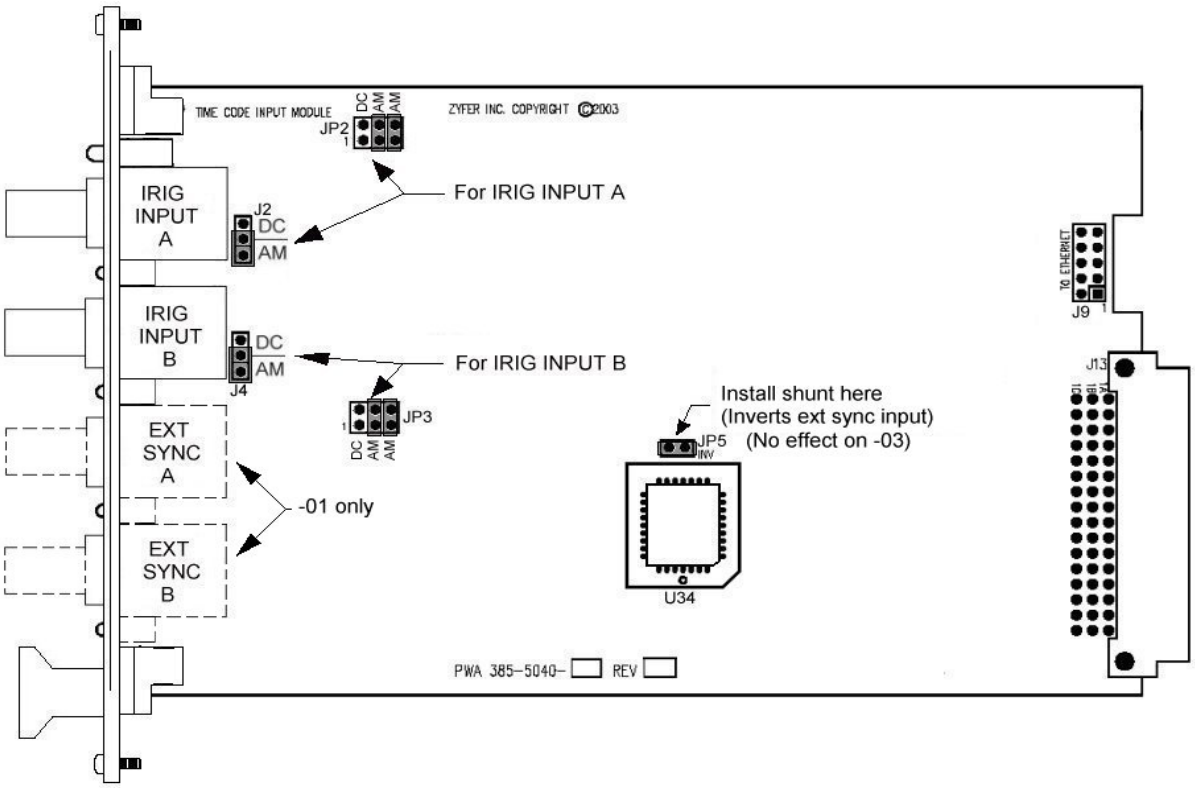

Figure 1 Time Code Input Configuration

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1.4 External Synchronization Inputs (385-4040-01 only)

Two input connectors (A and B) provide redundant synchronization inputs for DTF (distribution) systems. The automatic input switch monitors each input (presence detector) and can automatically switch to the other input in the event of a failure.

Note: Both external synchronization inputs must be the same frequency, and the input frequency must have an error of less than 1E-10 for Rubidium-systems (385-4060-01) and less than 1E-9 for Crystal-based systems (385-4060-02) for the internal oscillator to be able to accurately synchronize to the input.

1.4.1 External Synchronization Trigger Selection

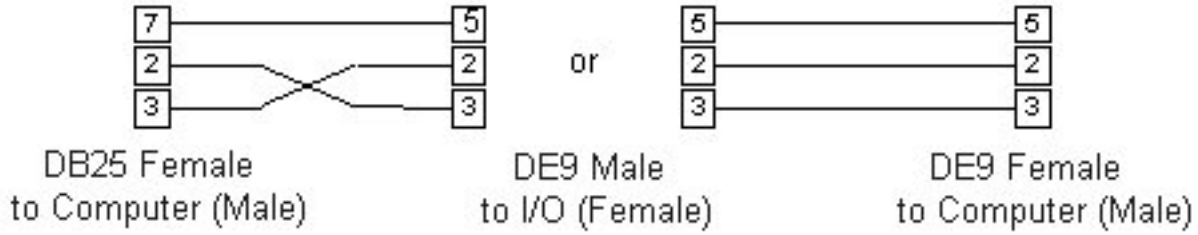
The user may also configure the external synchronization to trigger on the rising or falling edge of a 1PPS input. The default is with the shunt installed (rising edge trigger). See Figure 1 for location of shunt (J5).

1.5 Connecting the Control/Monitor Port (385-4040-03 only)

Remote control and monitor of the system's operation is provided through the 9 pin D connector. Connect the remote control/monitor device to the system's rear panel D-Subminiature connector as follows:

CONNECTOR PIN DESIGNATION		
PIN	SIGNAL	DESCRIPTION
1		NO CONNECTION
2	OUTPUT (TXD)	RS-232 OUTPUT
3	INPUT (RXD)	RS-232 INPUT
4		NO CONNECTION
5	RTN	Signal Ground
6		NO CONNECTION
7		NO CONNECTION
8		NO CONNECTION
9		NO CONNECTION

Note: The required mating connector is a 9-contact male "D-Subminiature" connector.



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1.6 Status

The status of the Time Code Input Module can be obtained from the GTF module SSTA message or viewed from the Front Panel display (Menu 8). The status message consists of an identification number (first byte) in hex format and a bus status message (second byte).

1.6.1 Status Message

The status message consists of an identification number (first byte) in hex format and a status message (second byte).

Dash Number	ID	Status							
		Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
-01,-03	0x54	System Fault	DTF Select 00 = None 01 = DTF #1 10 = DTF #2 11 = Both		Input Select 0 = A, 1 = B	Ext Input B Present	Not Used (0)	Ext Input A Present	Not Used (0)

1.6.2 Front Panel Display

Two displays relate to the Time Code Input Module. One is the standard Module Status display located in Menu 8. The following picture is an example of how the display will appear:

```
Slot 15 Time Code Input Module    0x54 ≡
Status: 0x00
```

Menu 7 provides for front panel controls of Slots 15 (primary) and 14 (secondary):

```
Primary CTL (Slot 15)     Ext In: 1PPS ≡
Input: AUTO  To:  BOTH      Status: 0x00
```

1.6.3 Commands

The INPC command is used to set the module for input (A, B, or both) and to which DTF the synchronization signal is being sent. See the protocol document 385-8002 for further information.

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1.7 Specifications

1.7.1 Time Code Inputs (IRIG inputs A/B)

Connector Type .....BNC female
Number of Inputs
385-4040-01, -03.....2
Input Type ..... IRIG B
Input Signal Type.....Amplitude Modulated(AM) or DC Shift (shunt selectable)

Input Signal Amplitude (AM).....>1.5 to <10 Vpp (Mark level)
Input Signal Mark/Space Ratio .....2.5:1 to 6:1(AM only)
Input Impedance.....> 100K Ω

Input Signal Levels (DC shift input) .. or <1.0V(low) to >2.0V(high)(TTL levels)
Note For DC-Code input an external termination is recommended.

1.7.2 Synchronization Inputs (Ext Sync A/B) 1 PPS input (385-4040-01 only)

Connector Type .....BNC female
Number of Inputs
385-4040-01.....2
Input Frequency.....1 PPS
Minimum Input Pulse Width..... 10 μS
Input Signal Type..... Square Wave or Pulse
Input Signal Amplitude.....1 to 5 Vpp
Input Stability.....≤ 1E-10 (w/Rb DTF)
≤ 1E-9 (w/Xtal DTF)
≤ 1E-8 (w/VXCO DTF)
Trigger..... Rising edge
Input Impedance.....> 100K Ω

Note: For 1 PPS input an external termination (50 Ω) is required.

The default setup will discipline the oscillator on the rising edge of the 1 PPS input. If falling edge synchronization is required, remove the module, remove the shunt at JP5, and reinstall the module.

1.7.3 Synchronization Inputs (Ext Sync A/B) Frequency inputs (385-4040-01 only)

Connector Type .....BNC female
Number of Inputs
385-4040-01.....2
Input Frequency.....1 MHz, 5 MHz, or 10 MHz
Input Signal Type.....Square or Sine Wave
Input Signal Amplitude..... 0.5 Vpp to 10 Vpp
Input Accuracy Error..... ≤ 1E-10 (Rb DTF)
≤ 1E-9 (Xtal DTF)
≤ 1E-8 (VXCO DTF)
Input Impedance.....> 100K Ω

Note: For square wave input an external termination (50 Ω) is required.

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1.7.4 RS-232 I/O Interface (385-4040-03 only)

Connector Type	9-contact female D-Subminiature
Output (TXD)	Pin 2
Input (RXD)	Pin 3
Signal Return	Pin 5
Signal Levels	RS-232 compatible
Baud Rate	19200
Data Bits	8
Stop Bits	1
Parity	None
Command Protocol	Per FEI-Zyfer Document 385-8002

Ethernet I/O Module 385-4024-01

This Ethernet I/O module provides a bi-directional 10Base-T network interface for remote control and monitor of the system. This Module has been replaced, for new designs please refer to the 385-4038-xx Ethernet module.

The CommSyncII System accepts an I/O Module in ether Slot 15 (Primary) or Slot 14 (Secondary). The CommSyncII-D will accept an I/O module in either Slot 8(Primary) or Slot 7(Secondary). The Primary slot communicates directly with the online GTF module, while the Secondary slot communicates directly with the offline (redundant) GTF module. The GSync system accepts the Module in Slot 4, and the GSyncII accepts the Module in Slot 8.

The Ethernet I/O module has four status LEDs, an RJ-45 connector and two BNC connectors. The RJ-45 connector provides for the 10Base-T network connection. Each BNC connector provides a TTL 1 PPS output, used for test purposes. When installed, this option supports simultaneous TCP/IP system monitoring/control, and network time service via separate port numbers.

1.1 LED Status Indicators

The module's LEDs indicate the status of the module. During the initial self-test all status LEDs should illuminate.

- Upper Green LED: Module Power Indicator
- Upper Red LED: System Fault indicator.

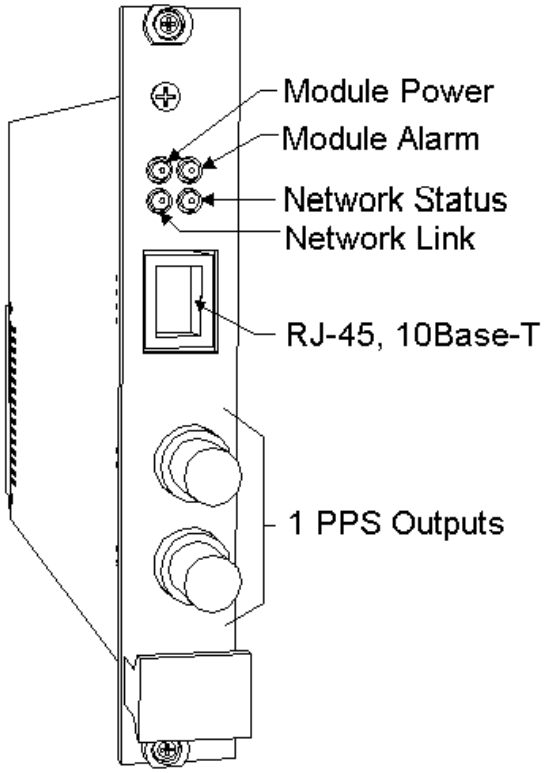
On *indicates a Fault with either GTF module.*

Note: a non-redundant system will indicate a fault due to the missing redundant GTF.

- Lower Green LED: Valid Network Link.
- Lower Red LED: Ethernet Status.

On *indicates initialization or a fatal fault.*

Flashing *indicates NTP synchronization is not yet available or is disabled.*



1.2 Status

The status of the Ethernet I/O Module can be obtained from the GTF module SSTA message or viewed from the Front Panel display (Menu 8). The status message consists of an identification number (first byte) in hex format and a bus status message (second byte).

1.2.1 Status Message

ID	Status
0x0F	Bus Status: Bit0=/online1, Bit1=/ready1, Bit2=fault1,

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	Bit4=/online2, Bit5=/ready2, Bit6=fault2

1.2.2 Front Panel Display (Example)

```
Slot 14 TCP/IP Ethernet I/O      0x0F ≡
Status: 0x89
```

1.2.3 Commands

The command $NTPC,x* enables/disables the NTP synchronization function. See the Serial Command Protocol Document (385-8002) for additional information.

1.3 Initial Configuration

The Ethernet I/O module must be configured before initial LAN installation. Configuration is to be made through the network port using Telnet (or Telnet equivalent software) on a PC. The Ethernet I/O module configuration is stored in nonvolatile memory and is retained after removal of power.

1.3.1 Configure the Ethernet Module

1.3.1.1 Set the IP Address

The Ethernet I/O module is shipped with default IP address of 10.10.10.210 (Primary). If two Ethernet I/O modules are installed (in a redundant system), the secondary IP address is set to 10.10.10.211 (Secondary).

Use the following sequence to set the IP address to one that is assigned by your Network Administrator.

a) Obtain an *IP Address from your Network Administrator*. Temporarily, remove the Ethernet I/O module from the CommSync II chassis. Take note of the controller *Hardware Address* printed on the product label that is located on the back of the module's daughter board. Re-install the module into its proper slot in the chassis.

b) Connect your PC and the Ethernet I/O module's RJ-45 connector to a 10Base-T network.

c) Set a static ARP with the Network Administrator's assigned *IP Address* using the *Hardware Address* of the controller.

The following is a command example for WinNT/Win95/Win98 at the DOS prompt:

arp -s 10.10.10.231 00-20-4A-02-64-0B *(Do not forget the "spaces")*

(The example uses an IP Address of 10.10.10.231 and a Hardware Address of 00-20-4A-02-64-0B. *Replace 10.10.10.231 with the IP Address assigned by your Network Administrator, and replace 00-20-4A-02-64-0b with the Hardware Address printed on the module's product label)*.

*Note: In order for the ARP command to work in **Windows**, the ARP table on the PC must have at least one IP address defined other than its own. Type "**arp -a"** at the DOS command prompt to verify that there is at least one entry in the ARP table. If there is no other entry beside the local machine, ping another IP*

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machine on your network to build the ARP table. This has to be a host other than the machine that you're working on. Once there is at least one entry in the ARP table, use the above command to ARP an IP Address to the Ethernet I/O module.

The above command example is for most Windows systems. The command example for most Unix systems is:

arp -s 10.10.10.231 00:20:4A:02:64:0B

(Note that the syntax uses colons instead of hyphens)

1.3.1.2 Select the Setup Mode

Prior to operation, certain parameters must be set. First open a Telnet connection to port number 1. This connection will fail, but the Ethernet I/O module will change its IP address to the special IP address shown in paragraph 1.3.1.1 step a): To open the connection to port 1, type the following at the DOS prompt:

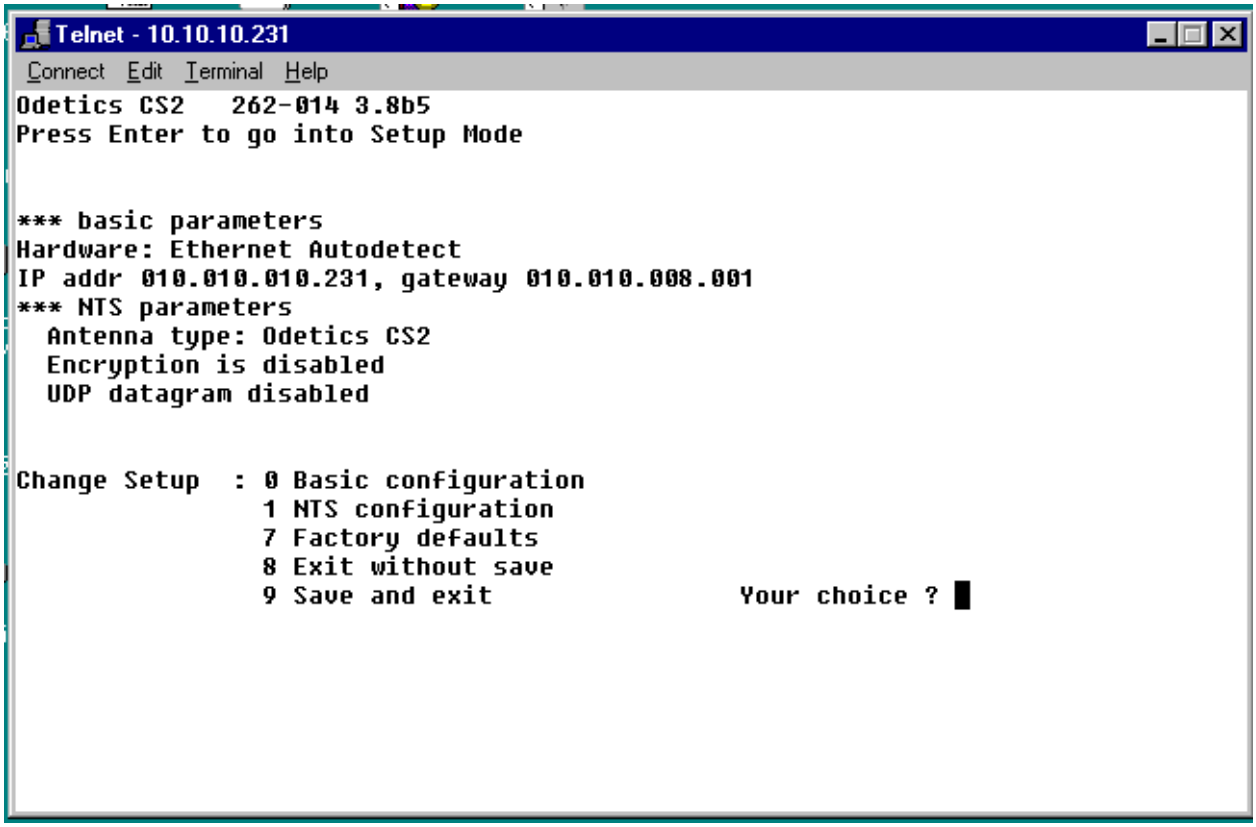
telnet 10.10.10.231 1

To enter the Setup Mode, open a Telnet connection to port 9999 by typing the following at the DOS prompt:

telnet 10.10.10.231 9999

When prompted, immediately press the ENTER key.

After successful connection to the Setup Mode, the following display appears:



The above screen shows details of the current user settings, followed by a list of five options.

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The cursor will be positioned at the end of the option menu. Type 0, 1, 7, 8, or 9 to perform the desired action. As you cycle through each parameter option, the current setting enclosed in brackets ( ) will be shown. Pressing the ENTER key on the computer keyboard will retain the current setting, and move you to the next setting prompt.

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1.3.2 Changing the Parameters

After Setup Mode is entered, the parameters can be changed; and default values can be confirmed with the ENTER key. The parameters must be stored, after which the Ethernet I/O board does a reset.

1.3.2.1 Basic Configuration (Menu 0)

To verify or change the basic parameters, type '0'. The following values can be verified and/or changed:

IP Address

The IP address must be set to a unique value in your network. The default IP Address setting for the Primary Control module is 10.10.10.210. In a redundant system, the default IP Address setting for the Secondary Control module is 10.10.10.211.

Note: Replace the default IP Addresses with new address obtained from your Network Administrator. Do not choose an address arbitrarily!

Gateway IP Address

If the LAN segment is local, the gateway address should be set to 000.000.000.000. However, if communication with other LAN segments is required, then the default gateway address must be set to address of the router that connects these segments. This address must be within the local network. If in doubt, consult the network administrator.

Netmask

A netmask defines how many bits from the IP address are to be taken as the network section and how many bits are to be taken as the host section. Select 00 for the automatic selection.

Telnet Configuration Password

The Telnet configuration password can be set to disable unauthorized access to the setup menu (9999) through a Telnet connection. Press *Y* (yes) to enter a password. Press *N* (no) to allow unauthorized access.

1.3.2.2 Ethernet I/O board NTS parameters (Menu 1)

The Network Time Server (NTS) operations of the Ethernet I/O module are controlled by various parameters. At present, only one parameter can be changed. To select the parameter, type '1'

Enter UDP Port

This parameter allows the selection of the port number for non-NTP proprietary protocols. The factory default is 0000 (Hex) for NTP and SNTP applications. If 25 (37 in hex) is entered the module will produce the TIME protocol defined in RFC868 (Number of seconds since 1/1/1990) If 77FF is selected the module will broadcast a proprietary time protocol, used by a KABA Benzing terminal. If a port number other than 0000 is selected, the following parameters can be selected:

Send Block Every "n" Minutes

Select (in minutes) how often the data block should be sent.

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Send UDP Broadcast

If the time information is to be sent to all devices connected to this LAN (broadcast), set this parameter to *Y* (yes); otherwise, set to *N* (no) if the system is to remain operating in the normal NTP or SNTP Server Mode.

UDP-Target Address

Select the target addresses to which the data block is to be sent. The data block can be sent over a Gateway or other devices to another part of the network. NTP and UDP/time port numbers are fixed to the values defined in the respective RFC's: port 37 (RFC868 UPD/time) and port 123(RFC1305 NTP).

Note: TIME protocol (pre RFC 868) provides UTC time when NTPC configuration setting is set for UTC time. ($NTPC,1) only.*

1.3.2.3 Factory Defaults (Menu 7)

Do not use this selection. It does not restore the correct defaults.

1.3.2.4 Exit without Save (Menu 8)

If you decide to leave the Setup Mode without invoking the parameter selections made above, then select *Change Setup: 8 Exit without save*.

Note: The connection to the host will be lost

1.3.2.5 Save and Exit (Menu 9)

If the above parameter selections are to be saved, then select *Change Setup: 9 Save and exit*. All parameters are then stored in nonvolatile memory, and the Ethernet I/O module resets and starts with the new IP address and other changed parameters.

Note: The connection to the host will be lost.

1.3.3 Command I/O Operations

Once the CommSync II is configured to your workstation or LAN, you can verify correct operation by communicating with the system.

To communicate it is necessary to open a Telnet session and connect to port 7777. This port is the command I/O port number. Commands may be entered directly through the Telnet window. See the protocol document, 385-8002 for command sequences and responses. To open a Telnet session to port 7777 type the following at the DOS prompt:

telnet 10.10.10.231 7777

Note: Replace address 10.10.10.231 with the address obtained from your Network Administrator. Do not choose an address arbitrarily!

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1.3.3.1 Typical Command/Response Strings

The following are some typical commands and response through a Telnet window. Refer to Serial Communication Protocol Document for a comprehensive listing.

System Status message (SSTA)

Command: $SSTA*<cr|lf>

Response: $SSTA,5,4,1,B1,4,0200,B1,4,0201,0140,0000,0000,0000,0000,2100,0000, 0000,0000,3100,0000,0000,0000,0FD8,0A50,0140,1999,354,18,54,56*6A<cr|lf>

GPS antenna location (SPOS,POS1,POS2)

Command: $POS1*<cr|lf>

Response: $POS1,33,48.5360,N,117,54.6274,W,12.09*51<cr|lf>

Date/Time message (TIME,TIM1,TIM2)

Command: $TIME*<cr|lf>

Response: $TIME,1999,354,18,55,36,3,4,5*11<cr|lf>

1.3.4 NTP Server Functions

NTP and UDP/time port numbers are fixed to the values defined in RFC-37 and RFC-123 respectively.

The NTP functions operate in server mode; symmetric operation modes are not supported because the CommSync II is designed to be the primary reference source and its time is referenced to the highly redundant GPS system. It will support NTP Version 1, 2 and 3 frames. The Ethernet I/O module will support full SNTP and all NTP functions required for reliable server operation. If authentication is not used, hundreds of clients can be supported without overloading. If the authentication option is enabled, up to seven MD5 or DES keys can be entered (key numbers 1...7). All key input must be done in hexadecimal format; MD5 key length is limited to eight characters. Authentication will require 40 mS for checking and generating the cryptograms, which is covered and averaged out by the protocol.

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1.4 Specifications

1.4.1 Ethernet Interface

Connector RJ-45
Signal 10Base-T
Configuration ..... IP address, netmask and gateway address must be selected by user
Compatibility ..... TCP/IP, Ethernet version 2.0/IEEE 802.3
NTP Support ..... Version 1, 2, 3, Time/UDP and SNTP

Note: The Ethernet/NTP output is first available when the system is Time locked and remains available during Holdover (Coasting) as long as the timing error is less than 1 mS (TFOM < 7) (1 μS (TFOM < 5) for GTFs with firmware 385-3022 V1.18.00 or below or 385-3021 V1.17.00 (SAASM) or below).

1.4.2 1 PPS Output

Number of Ports 2
Connector Type ..... BNC female
Rate ..... 1 PPS
Wave Shape ..... Pulse
Pulse Width ..... 2 mS
Synchronization Reference ..... UTC
Synchronization ..... Rising edge on-time (Leading edge)

Output Drive
- High Level ..... ≥ +2.0 V into 50 Ω load (≥ 3.0 V open circuit)
- Low Level ..... ≤ +0.5 V into 50 Ω load

Protection ..... Short circuit proof

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Ethernet I/O External Input Module 385-4038

The Ethernet I/O External Input Module provides a 10/100Base-T TCP/IP Ethernet connection for control and monitor of the system through either TELNET, or SNMP. The module also provides network time service (NTS) with NTP/SNTP time protocol, enabling the CommSyncII to function as a network time server. Optional connections are included for external synchronization input for the DTF modules.

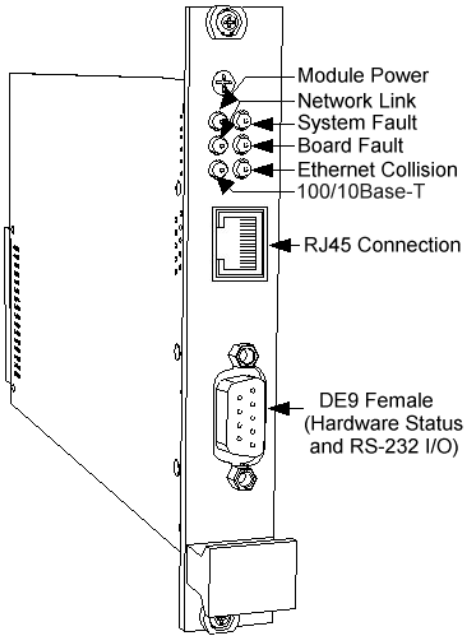
The CommSyncII System accepts an I/O Module in ether Slot 15 (Primary) or Slot 14 (Secondary). The CommSyncII-D will accept an I/O module in either Slot 8(Primary) or Slot 7(Secondary). The Primary slot communicates directly with the online GTF module, while the Secondary slot communicates directly with the offline (redundant) GTF module. The GSync system accepts the Module in Slot 4, and the GSyncII accepts the Module in Slot 8.

The 385-4038-01 module has a secondary RS-232 port, with a 9-pin D-Sub connector.

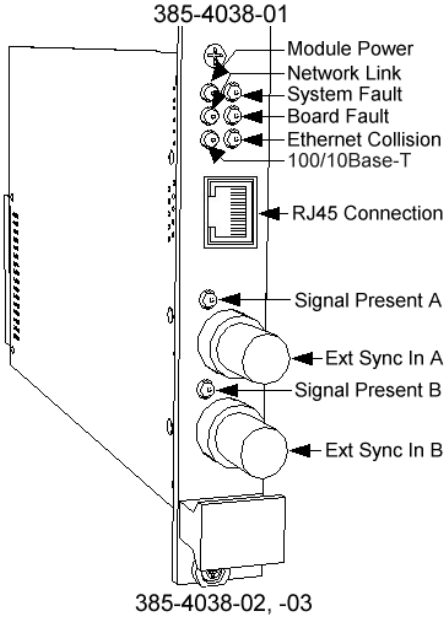
The 385-4038-02 has two BNC external input connectors, and the 385-4038-03 has two fiber optic external input connectors to discipline the DTF oscillator.

The 385-4038-04 has two BNC external input connectors, and the 9-pin D-sub connector in addition to the RJ-45 port connection.

The module is “hot swappable”. It can be removed or installed without removing power from the system or interrupting operations.



385-4038-01



385-4038-02, -03

1.1 LED Status Indicators

- The top green LED lights when power is applied to the module.
- The top red LED indicates a system fault. Note: Currently, a single-GTF/DTF system will indicate a system fault.
- The second green LED (Network Link) illuminates when the module is connected to the network.
- The second red LED indicates a Ethernet module fault when it is on. When the LED blinks, it indicates that NTP is not available.
- The third green LED illuminates when the network connection detected is 100Base-T. Off indicates 10Base-T connection.
- The third red LED indicates Ethernet collision.
- The 385-4038-02, -03 and -04 modules have two additional LEDs, Signal Present A and Signal Present B which lights up when a signal is detected at the respective input.

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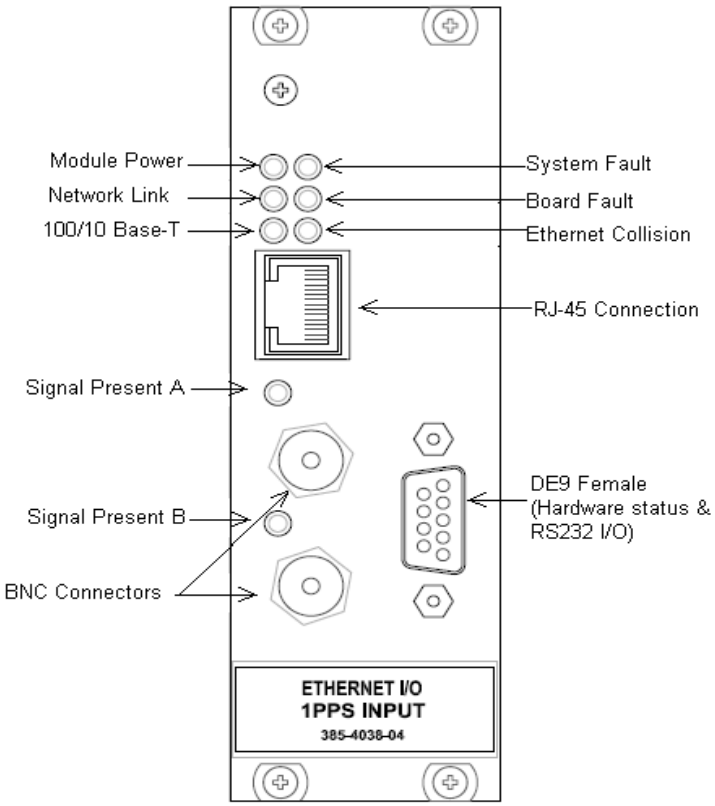

1.2 Module Configurations

Part Number	I/O Connector	External Synchronization Input	Synchronization Connector
385-4038-01	RJ45, DE-9	None	None
385-4038-02	RJ45	1 PPS, 1 MHz, 5 MHz, 10 MHz	2 x BNC
385-4038-03	RJ45	1 MHz, 5 MHz, 10 MHz	2 x F.O.
385-4038-04	RJ45, DE-9	1 PPS	2 x BNC.

1.3 Status

The status of the Ethernet I/O External Input Module can be obtained from the GTF module SSTA message or viewed from the Front Panel display (Menu 8). The status message consists of an identification number (first byte) in hex format and a bus status message (second byte).

1.3.1 Status Message

ID	Status
0x0E	Bit 7 = System Fault Bit 6,5 = DTF Select (00 = None, 01 = #1, 10 = #2, 11 = Both) Bit 4 = Input Select (A = 0, B = 1) Bit 3 = Ext. Input B Present Bit 2 = Ext. Lock B Present (not used) Bit 1 = Ext. Input A Present Bit 0 = Ext. Lock A Present (not used)

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1.3.2 Front Panel Display (Example)

```
Slot 15 Ethernet Ext Input Module 0x0E ≡
Status: 0x1A   NTP Source:Standard (UTC)
```

1.3.3 Commands

The command $NTPC,x* enables/disables the NTP synchronization function.

The command $INPC* will provide status and will configure an external input module (385-4038-02 ,-03,-04).

The $ETHI*, $ETHG*, $ETHM*, $ETHT*, and $ETHV* commands are used for setting IP Address, Gateway Address, Netmask, Trap Address, and Ethernet Module software version. See the Serial Command Protocol Document (385-8002) for additional information.

The $PSWC*, $PSWD*, $USRA*, $USRD*, and $USRL* commands are used password configuration. These commands are effective as of firmware version V1.03.00. See the Serial Command Protocol Document (385-8002) for additional information on these commands. See for para. 1.4.6 for instructions on password configuration.

1.4 Configuring the Module

Before connecting to your local area network (LAN) you should first Obtain an IP Address from your Network Administrator. Do not choose an address arbitrarily!

Setting the IP Address, Gateway, Netmask, and Trap is accomplished either via the front panel menus or the RS-232 factory test port. From the front panel menus the Primary control slot can be accessed through menu 9.2. The Secondary control slot menu is 9.3.

1.4.1 Configure the IP Address

The command, $ETHI*, will request the current IP Address of the installed Ethernet I/O Modules. To set the IP Address, send $ETHI,s,xxx.xxx.xxx.xxx*, where s is 0 for the primary and 1 for the secondary, xxx.xxx.xxx.xxx is the requested IP Address.

Note: The board will reset to make this change and restart after approximately 5 seconds.

1.4.2 Configure the Gateway Address

The command, $ETHG*, will request the current Gateway Address of the installed modules. To set the Gateway Address, send $ETHG,s,xxx.xxx.xxx.xxx. (Note that the Gateway Address must have the same domain as the IP Address.)

Note: The board will reset to make this change and restart after approximately 5 seconds.

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1.4.3 Configure the Network Mask

The command, $ETHM*, will request the current Network Mask of the installed modules. To set the Network Mask, send $ETHM,s,xxx.xxx.xxx.xxx, where s is 0 for the primary, and 1 for the secondary, and xxx.xxx.xxx.xxx is the Network Mask. (The typical Network Mask is 255.255.255.0.)

Note: The board will reset to make this change and restart after approximately 5 seconds.

1.4.4 Configure the Trap Address

The command, $ETHT*, will request the current Trap Address of the installed modules. If required, the address can be set by sending the command, $ETHT,s,xxx.xxx.xxx.xxx*, where s is 0 for the primary or 1 for the secondary, and xxx.xxx.xxx.xxx is the required address to which to send the trap. The module does not reset after setting the Trap Address.

The Trap function send the system status output ($SSTA*) to the address set in this step. The trap will be sent whenever there is a change in any system status. See the Serial Protocol document 385-8002 for more information on the system status SSTA output.

1.4.5 Ethernet Software Version

The version of the software in the Ethernet I/O External Input Module may be read by sending $ETHV*.

1.4.6 Ethernet Password Configuration

As of Ethernet Firmware (385-3044) version V1.03.00, Ethernet I/O Modules include the capability to control Telnet access via passwords. Ethernet I/O Modules are shipped with password control disabled. To use this function, the module will need to be configured for users and passwords. The following paragraphs outline the process to enable passwords. For a complete description of the commands, refer to the Serial Protocol document 385-8002.

1.4.6.1 Enable Password Control

Password control is enabled and disabled with the $PSWC,X* command. When X = 0, the password control is off and passwords are not necessary to access the module using Telnet. When X = 1, password control is enabled. In this condition, there are four possible users and an Administrator, user name “Admin”. Each user name is unique, and each has an individual password.

Note that when password control is changed (either enabled or disabled), the module firmware will reboot. If the command to enable or disable the password control is sent via Telnet, the user will need to reestablish the Telnet connection to the module after reboot. In addition, if password control is enabled, the user list is reset to the default condition, with only the Admin user and the default password of “Zyfer”. Users and passwords will need to be reconfigured.

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1.4.6.2 Setting Up Users

When password control is enabled, there is one user established “Admin”. The password for Admin is Zyfer.

Note: Both name and password are case sensitive. The “Admin” user is the administrator and may access the module via Telnet.

It is recommended that the Admin user change the default password to a new password for protection of Admin. This is accomplished using the $PSWD,Oldpswd,Newpswd* command, where Oldpswd is the current password (“Zyfer”, in this case), and Newpswd is the desired password selected by the user. Passwords are case sensitive and may consist of any combination of alphanumeric characters from 1 to 8 characters in length.

Once the Admin user is logged in, users may be added. This is accomplished with the $USRA,Username,Password* command. Both components must be present to add a user. (Users may change their password once they are logged in.) Like passwords, user names are case sensitive and may consist of any combination of alphanumeric characters from 1 to 8 characters in length. The Admin user may add up to four (4) additional users.

Note: Only one user may be logged into the module at a time.

Note: The module has a timeout. After one hour without sending a command, the connection will be lost.

To delete a user, the Admin user sends the $USRD,Username* command, where Username is the user to delete.

To view the list of users, send the $USRL* command. All user names will be displayed.

Note that only the Admin user may add or delete users.

Note: If the Ethernet I/O Module firmware is updated after use, user and password list are erased. The user and password list will need to be reconfigured.

1.5 Telnet Access through the Ethernet Module

Once the IP address has been set a Telnet session can be initiated. The following example is Telnet via a Windows PC:

From a DOS prompt type:

telnet xxx.xxx.xxx.xxx (where xxx.xxx.xxx.xxx is the module IP address)

Note: Terminal preferences should be set to no local echo.

If password control is enabled, the screen will first display a Login request. Enter the name of a valid user. The screen will then display a password request. Enter the correct password for the selected user. (User name and password values are case sensitive.) This will provide access via Telnet for commands and responses.

See the Serial Command protocol Document for Command/Responses through the Telnet interface.

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1.6 SNMP Access through the Ethernet Module

SNMP provides an easy way for administrators to retrieve information about devices on their networks as well as the network itself. The SNMP structure provides a network administrator the ability to both monitor and control the CommSync II. SNMP places all operations in a simple get (read), and set (write) format.

The FEI-Zyfer CommSync II custom MIB is a set of variables (object identifier, OID) that are private, or custom extensions to the Internet standard MIB II. You can compile the FEI-Zyfer custom MIB with your network management software to enable the SNMP agent to respond to MIB-related queries.

The FEI-Zyfer CommSync II Custom MIB file is available at the online resource center at http://www.fei-zyfer.com/support.htm.

SNMP requests to the CommSync II system are accepted using one of two custom community names. For read (monitor) access the community name is 'zyferrd'. Write (control) access is granted by using 'zyferwrt' community name.

The CommSync II will send a Trap message to a specified address ($ETHT* command) when ever there is a change in the system status. See the Serial Protocol document 385-8002 for more information on the system status SSTA output.

Note: Since SNMP is not affected by password control, it can be exploited by hackers who are trying to attack a network, making it a potential security risk. To eliminate this risk the CommSync II should be installed behind a suitable firewall set to block UDP ports 161 and 162 to the outside world.

1.7 Network Time service (NTP) Server Functions

The Ethernet I/O module supports full SNTP (RFC-2030) and NTP (RFC-1119/1305) functions required for reliable server operation. The Network Time Service (NTS) is available when the system is Time locked and will remain available during Holdover (Coasting) as long as the estimated timing error is less than 10 uS (TFOM < 5).

Note1 SNTP (RFC-2030) and NTP (RFC-1119/1305) provide UTC time when NTPC configuration setting is set for UTC time. ($NTPC,1) only.*

Note2: The CommSync II network time service functions in server mode only. Typical symmetric operation modes are supported only when GPS is not available as the CommSync II is designed to be the primary (stratum 1) time/reference source.

1.8 Specifications

1.8.1 Ethernet Interface

Connector	RJ-45
Signal	10/100Base-T
Configuration	IP address, netmask and gateway address must be selected by user
Compatibility	TCP/IP, Ethernet version 2.0/IEEE 802.3,
SNMP support	MIB2, and FEI-Zyfer custom MIB, SNMPv1
NTP Support	Version 1, 2, 3, and SNTP

Note: The Ethernet/NTP output is first available when the system is Time locked and remains available during Holdover (Coasting) as long as the timing error is less than 1 mS (TFOM < 7) (1 μS (TFOM < 5) for GTFs with firmware 385-3022 V1.18.00 or below or 385-3021 V1.17.00 (SAASM) or below).

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1.8.2 RS-232 I/O Interface (385-4038-01 only)

Connector Type ..... 9-contact female D-Subminiature
Output (TXD) ..... Pin 2
Input (RXD) ..... Pin 3
Signal Return ..... Pin 5
Signal Levels ..... RS-232 compatible
Baud Rate 19200
Data Bits 8
Stop Bits 1
Parity ..... None
Command Protocol ..... Per FEI-Zyfer Document 385-8002

1.8.3 Input Specifications 385-4038-02 (1 PPS input)

Connector Type ..... BNC female
Number of Inputs ..... 2 (A and B inputs)
Input Frequency ..... 1 PPS
Minimum Input Pulse Width ..... 10 μS
Input Signal Type ..... Square Wave or Pulse
Input Signal Amplitude ..... 1 to 5 Vpp
Input Stability ..... ≤ 1E-10 (Rb DTF)
≤ 1E-9 (Xtal DTF)
≤ 1E-8 (VXCO DTF)
Trigger ..... Rising edge
Input Impedance ..... > 100K Ω

Note: For 1 PPS input an external termination (50 Ω) is required.

The default condition will discipline the oscillator on the rising edge of the 1 PPS input. If falling edge synchronization is required, remove the module, remove the shunt at JP6, and reinstall the module.

1.8.4 Input Specifications 385-4038-02 (Frequency input)

Connector Type ..... BNC female
Number of Inputs ..... 2 (A and B inputs)
Input Frequency ..... 1 MHz, 5 MHz, or 10 MHz
Input Signal Type ..... Square Wave or Sine Wave
Input Signal Amplitude ..... 0.7 Vpp to 10 Vpp
Input Stability ..... ≤ 1E-10 (Rb DTF)
≤ 1E-9 (Xtal DTF)
≤ 1E-8 (VXCO DTF)
Input Impedance ..... > 100K Ω

Note: For square wave input an external termination (50 Ω) is required.

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1.8.5 Input Specifications 385-4038-03 (Fiber-Optic Frequency input)

Connector Type ..... ST
Number of Inputs ..... 2 (A and B inputs)
Input Frequency..... 1 MHz, 5 MHz, 10 MHz
Input Signal Type..... Square Wave or Pulse
Input Signal Amplitude..... -8 to -22 dBm
Input Accuracy Error..... ≤ 1E-10 (Rb DTF)
≤ 1E-9 (Xtal DTF)
≤ 1E-8 (VXCO DTF)
Wavelength..... 850 nm
Fiber Cable..... Multimode 50/125 or 62.5/125

1.8.6 Input Specifications 385-4038-04 (1PPS input, RS232)

Connector 1 Type .....BNC female
Number of Inputs ..... 2 (A and B inputs)
Input Frequency..... 1 PPS
Minimum Input Pulse Width..... 10 µS
Input Signal Type..... Square Wave or Pulse
Input Signal Amplitude
Logic 1 ..... 10 VDC ± 1 VDC
Logic 0..... 0 VDC ± 1 VDC
Input Stability..... < 1E-10 (Rb DTF)
.....< 1E-9 (Xtal DTF)
Synchronization..... Rising edge on-tiime
Input Impedance..... 50Ω
Connector 2 Type .....9-contact female D-Subminiature
Output (TXD) .....Pin 2
Input (RXD).....Pin 3
Signal Return.....Pin 5
Signal Levels .....RS-232 compatible
Baud Rate 19200
Data Bits..... 8
Stop Bits..... 1
Parity ..... None
Command Protocol..... Per FEI-Zyfer Document 385-8002

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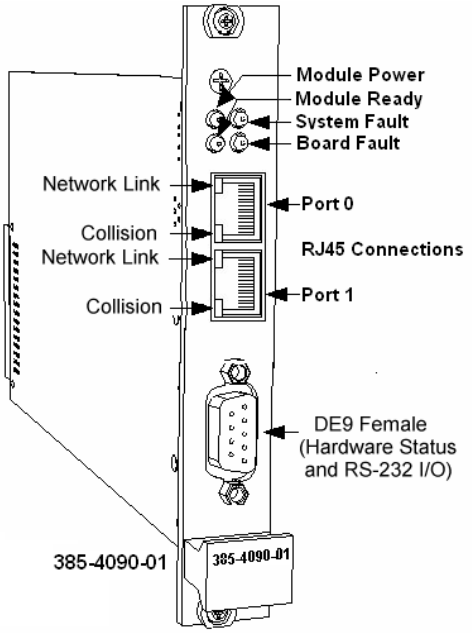
Dual Port Ethernet I/O External Input Module 385-4090

The Dual Port Ethernet I/O External Input Module provides two independent 10/100Base-T TCP/IP Ethernet connections with support for both IPv4 and IPv6 addressing. This allows the same Ethernet module to connect to two separate networks for control and monitor of the CommSync II family system through either TELNET, SSH or SNMP. The module also provides network time service (NTP/SNTP).



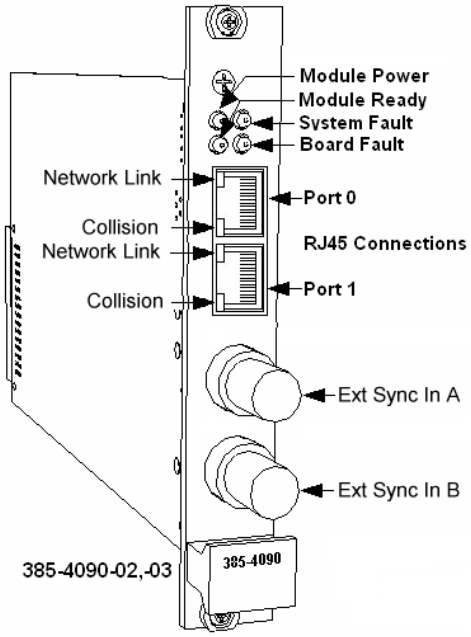
The CommSync II System accepts an I/O Module in either Slot 15 (Primary) or Slot 14 (Secondary).

For a CommSyncII-D Slot 8(Primary) or Slot 7(Secondary).

The Primary slot communicates directly with the online GTF module, while the Secondary slot communicates directly with the offline (redundant) GTF module.

The GSync system accepts the Module in Slot 4, and the GSyncII accepts the Module in Slot 8.

1.1 LED Status Indicators



- The top Green LED lights when power is applied to the module.
- The second Green LED indicates that the Dual Port Ethernet Module has passed it's self test, and is Ready.
- The top Red LED indicates a system fault.

  Note:In a redundant system a single-GTF/DTF will indicate a system fault.

- The second Red LED indicates a Ethernet module fault when it is on. When the LED blinks, it indicates that NTP time is not available.
- Each port connector has a Green LED that illuminates when the network connection is detected, and a Yellow LED that illuminates when a network collision has occurred.

1.2 Module Configurations

The 385-4090-01 module has an additional serial (RS-232) port, with a 9-pin D-Sub connector.

The 385-4090-02 has two BNC external input connectors, and the 385-4038-03 has two fiber optic external input connectors to discipline the DTF oscillator.

Part Number	I/O Connector	External Synchronization Input	Synchronization Connector
385-4090-01	2x RJ45, DE-9	None	None
385-4090-02	2x RJ45	1 PPS, 1 MHz, 5 MHz, 10 MHz	2 x BNC
385-4090-03	2x RJ45	1 MHz, 5 MHz, 10 MHz	2 x F.O.

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1.3 Status

The status of the Ethernet I/O External Input Module can be obtained from the GTF module SSTA message or viewed from the Front Panel display (Menu 8). The status message consists of an identification number (first byte) in hex format and a bus status message (second byte).

1.3.1 Status Message

ID	Status
0x0D	Bit 7 = CommSync II System Fault (same as top red LED) Bit 6,5 = DTF Select (00 = None, 01 = #1, 10 = #2, 11 = Both) Bit 4 = Input Select (A = 0, B = 1) Bit 3 = Ext. Input B Present Bit 2 = Module Fault Bit 1 = Ext. Input A Present Bit 0 = Module Fault

1.3.2 Front Panel Display (Menu 8, Example)

```
Slot 15 TCP/IP Dual Ethernet      0x0D ≡
Status: 0x00   NTP Source:Standard (UTC)
```

1.4 Configuring the Module

Before connecting to your local area network (LAN) you should first obtain an IP Address from your Network Administrator. Do not choose an address arbitrarily!

See the Serial Command Protocol Document (385-8002) for specific command information.

Configuring the module for IPv4 is accomplished either via the RS-232 factory test port , or front panel menus (Menu 9).

Setting IPv6 addresses must be done through the RS-232 factory test port, or via IPv4 telnet connection.

The $ETHT,s,p* command sets either an IPv4 or IPv6 Trap Addresses by slot(s) and port(p).

1.4.1 IPv4

From the factory test port the $ETHI,s,p*, $ETHG,s,p*, and $ETHM,s,p*, commands are used for setting IPv4 Addresses, Gateway, and Netmask by slot(s) and port(p). From the front panel menus the Primary control slot can be accessed through menu 9.2. The Secondary control slot menu is 9.3.

The command $NTPC,x* enables/disables the NTP synchronization function by selecting the time source (from the GTF) to the module.

The $INPC* command is used to configure an external input module (385-4090-02, 385-4090-03 only).

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1.4.1.1 Setting IPv4 addresses

The command, $ETHI,s*, will request the current IPv4 Addresses of the installed Ethernet I/O Module.

To set a port's IPv4 Address, send $ETHI,s,p,xxx.xxx.xxx.xxx*, where 's' is 0 for the primary slot and 1 for the secondary slot, 'p' is 0 for port 0, and 1 for port 1, and xxx.xxx.xxx.xxx is the new IPv4 Address.

Note: Each port on a single Dual Port Ethernet module must be connected to a separate network.

Note: The board will reset to make this change and restart after approximately 5 seconds.

1.4.1.2 Setting IPv4 NetMasks

The command, $ETHM,s*, will request the current IPv4 NetMasks of the installed Ethernet I/O Module.

To set a port's Network Mask, send $ETHM,s,p,xxx.xxx.xxx.xxx, where s is 0 for the primary, and 1 for the secondary, 'p' is 0 for port 0, and 1 is for port 1, and xxx.xxx.xxx.xxx is the Network Mask. A typical Network Mask is 255.255.255.0 representing 24 bits network, and 8 bits for devices.

Note: The board will reset to make this change and restart after approximately 5 seconds.

1.4.1.3 Setting IPv4 Gateway

The $ETHG,s, will request the current IPv4 Gateway of the installed module.

To set a port's Gateway Address, send $ETHG,s,xxx.xxx.xxx.xxx. where 's' is 0 for the primary slot and 1 for the secondary slot. (The Gateway Address must be in the same domain as the routed IP Address.)

Note: The Dual Port Ethernet Module allows for a single IPv4 Gateway setting for routed networks.

Note: The board will reset to make this change and restart after approximately 5 seconds.

1.4.2 IPv6

From the factory test port the $ET6I,s,p*, $ET6G,s,p*, and $ET6M,s,p* commands are used for setting IPv6 Addresses, Gateway, and Netmask by slot(s) and port(p).

1.4.2.1 Setting IPv6 address

The command, $ET6I,s*, will request the current IPv6 Addresses of the installed Ethernet I/O Module.

To set a port to an IPv6 Address, send $ET6I,s,p,x:x:x:x:x:x:x:x*, where 's' is 0 for the primary slot and 1 for the secondary slot, 'p' is 0 for port 0, and 1 is for port 1, and x:x:x:x:x:x:x:x is the new IPv6 Address.

Note: Each port on a single Dual Port Ethernet module must be connected to separate networks.

Note: The board will reset to make this change and restart after approximately 5 seconds.

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1.4.2.2 Setting IPv6 NetMask

In IPv6 the netmask is represented by the number of bits in the netmask

The command, $ET6M,s*, will request the current IPv6 NetMask of the installed Ethernet I/O Module.

To set the Network Mask, send $ET6M,s,p,m* where ‘s’ is 0 for the primary, and 1 for the secondary, ‘p’ is 0 for port 0, and 1 is for port 1,and ‘m’ is the Network Mask (in number of netbits).

Note: The board will reset to make this change and restart after approximately 5 seconds.

1.4.2.3 Setting IPv6 Gateway

The $ET6G,s, will request the current IPv6 Gateway of the installed module.

To set the Gateway Address, send $ET6G,s,x:x:x:x:x:x:x:x. (Note that the Gateway Address must be in the same domain as the routed IP Address.)

Note: The Dual Port Ethernet Module allows for a single IPv6 Gateway setting for routed networks.

Note: The board will reset to make this change and restart after approximately 5 seconds.

1.4.3 Configure the SNMP Trap Address

The command, $ETHT,s*, will request the current Trap Addresses of the installed module.

The $ETHT,s,p* will set either the IPv4, or a IPv6 SNMP Trap destination address. The address can be set by sending the command, $ETHT,s,xxx.xxx.xxx.xxx* (IPv4) or $ETHT,s,x:x:x:x:x:x:x:x*(IPv6), where s is 0 for the primary or 1 for the secondary, and xxx.xxx.xxx.xxx or x:x:x:x:x:x:x:x is the address to send the trap. The module does not reset after setting the Trap Address.

1.4.4 Ethernet Software Version

The version of the software in the Ethernet I/O External Input Module may be read by sending $ETHV,s*, where ‘s’ is 0 for the primary slot and 1 for the secondary slot.

1.5 Telnet Access through the Ethernet Module

Once the IP address has been set a Telnet session can be initiated. The following example is Telnet via a Windows PC:

From a DOS prompt type:

telnet xxx.xxx.xxx.xxx (where xxx.xxx.xxx.xxx is the module IPv4 address)

Note: Terminal preferences should be set to no local echo.

See the Serial Command protocol Document 382-8002 for Command/Responses through the Telnet interface.

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1.5.1 Ethernet Password Configuration

The Ethernet I/O Modules include the capability to control Telnet access via passwords. Ethernet I/O Modules are shipped with password control disabled. To use this function, the module will need to be configured for users and passwords. The $PSWD command is used to enable password operation, or a complete description of the password configuration commands, refer to the Serial Protocol document 385-8002.

When password control is enabled, on telnet connection the session will require a username, and password be entered before the connection is completed.

1.5.2 SSH Access

The 385-4090 Ethernet I/O Modules include the capability utilize Secure Shell (SSH) in place of Telnet. SSH establishes a secure channel between a local user and a remote device utilizing public-key cryptography to authenticate the remote device. With SSH passwords are automatically enabled. The Command to enable SSH, is $NCON,SSH*. For a complete description of the $NCON command, refer to the Serial Protocol document 385-8002. When SSH is enabled the password control is automatically enabled, when connecting with SSH a user will be prompted for a username and password prior to connection.

1.6 SNMP Access through the Ethernet Module

SNMP provides an easy way for administrators to retrieve information about devices on their networks as well as the network itself. The SNMP structure provides a network administrator the ability to both monitor and control the CommSyncII device. SNMP places all operations in a simple get (read), and set (write) format.

1.6.1 Management Information Base (MIB)

The FEI-Zyfer CommSync II custom MIB is a set of variables (object identifier, OID) that can be compiled with network management software to enable the SNMP agent to respond to MIB-related queries.

The FEI-Zyfer CommSync II Custom MIB file is available at the online resource center at http://www.fei-zyfer.com/support.htm.

In SNMPv1 and SNMPv2 requests to the CommSync II system are accepted using one of two custom community names. For read (monitor) access the default community name is ‘zyferrd’. Write (control) access is granted by using ‘zyferwrt’ community name. The 385-4090 has two commands to allow a user to change the community names (see $RNMP/$WNMP commands in the Serial Protocol document 385-8002 for details.

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1.6.2 SNMP Versions

The SNMP version is selectable through the $SNMV,x* command, where 'x' is the SNMP version number required. In the 385-4090 Dual port Ethernet module SNMP versions are mutually exclusive, if SNMPv2c is selected, SNMPv1 and SNMPv3 are disabled (The SNMV default is SNMPv1).

$SNMV,1* selects SNMP version 1. SNMPv1 is the initial implementation of the SNMP protocol, and is widely used and is the de-facto network-management protocol in the Internet community.

$SNMV,2* selects SNMP version 2c. SNMPv2c is a revision of version 1 that includes improvements in the areas of performance, and security. The message format is different form the previous version, although the community name-based security scheme of SNMPv1 was retained.

$SNMV,3* selects SNMP version 3. SNMPv3 is the current standard SNMP framework, supplementing the SNMPv2 Framework and adding new message formats, Security for Messages (authentication and encryption), and improved Access Control (see $SNMK and $VACM commands in the serial protocol document 385-8002).

Note: Since SNMPv1 and SNMPv2c are not protected by password control, it can be exploited by hackers who are trying to attack a network, making it a potential security risk. To eliminate this risk the CommSync II should be installed behind a suitable firewall set to block UDP ports 161 and 162 to the outside world.

1.6.3 SNMP Traps

The $TSTA command can be used to configure the TRAP output, A $TSTA setting of '2' (default) will send two ($SSTA and $STAT) traps each time there is a change in the system status. See the Serial Protocol document 385-8002 for more information on the $TSTA command.

The CommSync II will send a Trap message to a specified address (set by the $ETHT* command) when ever one of the following occurs:

a. Start up of the Ethernet I/O Module, (Cold Start Trap),

b. An attempt to write or read without the required community name (zyferrd, or zyferwrt) (Authentication Failure Trap)

   Note: Community names can be changed with the $RNMP and the $WNMP commands ,

c. Any SSTA message sent from the GTF is output as a TRAP message. The SSTA message is a comprehensive message reporting the status of both GTF modules, and all option modules. See the Serial Protocol document 385-8002 for more information on this message. ($TSTA,0* setting)

d. Any SSTA message sent by the GTF is interpreted and is output from the system with a $STAT message. The STAT message is a descriptive TRAP, for example: if GTF#2 loses GPS a trap containing "$STAT,GTF2,Holdover, lost GPS reference* will be sent. ($TSTA,1* setting)

e. Any SSTA message sent by the GTF and the STAT message are both output as a TRAP messages. ($TSTA,2* setting(default))

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1.7 Network Time service (NTP) Server Functions

The Ethernet I/O module supports full SNTP (RFC-2030) and NTP (RFC-1119/1305) functions required for reliable server operation. The Network Time Service (NTS) is available when the system is Time locked and will remain available during Holdover (Coasting) as long as the estimated timing error is less than 1mS (TFOM < 7).

Note1: SNTP (RFC-2030) and NTP (RFC-1119/1305) provide UTC time when NTPC configuration setting is set for UTC time. ($NTPC,1) only.*

Note2: The CommSync II network time service functions in server or broadcast modes. Symmetric operation modes are supported only when GPS is not available as the CommSync II is designed to be the primary (stratum 1) time/reference source.

1.7.1 Network Time service (NTP) Modes

On the 385-4090 the $NTPO command can be used to specify the NTP operation modes:

$NTPO,1* (default) selects NTPv3 Server mode,

$NTPO,2 or 3 select NTPv3 Broadcast and Symmetric modes.

$NTPO,4, 5, or 6 select SNTPv4 Server or Broadcast modes (IPv4 or IPv6). See the Serial Protocol document 385-8002 for more information on the NTP controls.

1.7.2 NTP Broadcast Modes

In addition to the $NTPO setting the braodcast IP address is selected through the $NTPBI (IPv4)/(NTPB6I (IPv6), and the broadcast interval is selected by the $NTPB commands. See the Serial Protocol document 385-8002 for more information on the NTP broadcast mode controls.

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1.8 Specifications

1.8.1 Ethernet Interface

Connector RJ-45
Signal 10/100Base-T
Configuration ..... IPv4 address, netmask and gateway selected by user
Configuration ..... IPv6 address, netmask and gateway selected by user
Compatibility ..... TCP/IP, Ethernet version 2.0/IEEE 802.3,
SNMP support .....MIB2, and FEI-Zyfer custom MIB, SNMPv1,v2c and v3
NTP Support..... Version 1, 2, 3, and SNTP

Note: The Ethernet/NTP output is first available when the system is Time locked and remains available during Holdover (Coasting) as long as the timing error is less than 1 mS (TFOM < 7).

1.8.2 RS-232 I/O Interface (385-4090-01 only)

Connector Type .....9-contact female D-Subminiature
Output (TXD) .....Pin 2
Input (RXD).....Pin 3
Signal Return.....Pin 5
Signal Levels .....RS-232 compatible
Baud Rate 19200
Data Bits.....8
Stop Bits 1
Parity ..... None
Command Protocol..... Per FEI-Zyfer Document 385-8002

1.8.3 Input Specifications 385-4090-02 (1 PPS input)

Connector Type .....BNC female
Number of Inputs ..... 2 (A and B inputs)
Input Frequency.....1 PPS
Minimum Input Pulse Width..... 10 μS
Input Signal Type..... Square Wave or Pulse
Input Signal Amplitude.....1 to 5 Vpp
Input Stability..... ≤ 1E-10 (Rb DTF)
≤ 1E-9 (Xtal DTF)
≤ 1E-8 (VXCO DTF)
Trigger ..... Rising edge
Input Impedance.....> 100K Ω

Note: For 1 PPS input an external termination (50 Ω) is required.

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1.8.4 Input Specifications 385-4090-02 (Frequency input)

Connector Type .....BNC female
Number of Inputs ..... 2 (A and B inputs)
Input Frequency.....1 MHz, 5 MHz, or 10 MHz
Input Signal Type.....Square Wave or Sine Wave
Input Signal Amplitude..... 0.7 Vpp to 10 Vpp
Input Stability..... ≤ 1E-10 (Rb DTF)
≤ 1E-9 (Xtal DTF)
≤ 1E-8 (VXCO DTF)
Input Impedance.....> 100K Ω

Note: For square wave input an external termination (50 Ω) is required.

Input Specifications 385-4090-03 (Fiber-Optic Frequency input)

Connector Type ..... ST
Number of Inputs ..... 2 (A and B inputs)
Input Frequency..... 1 MHz, 5 MHz, 10 MHz
Input Signal Type..... Square Wave or Pulse
Input Signal Amplitude..... -8 to -22 dBm
Input Accuracy Error..... ≤ 1E-10 (Rb DTF)
≤ 1E-9 (Xtal DTF)
≤ 1E-8 (VXCO DTF)
Wavelength.....850 nm
Fiber Cable..... Multimode 50/125 or 62.5/125

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Section 2 OUTPUT MODULES

This section provides information on the various output modules.

Frequency Output Modules

A variety of standard frequency outputs are available. One module, the Multiple Output Module, 385-4067, provides four separate outputs of 1 PPS and 1, 5, and 10 MHz sine waves.

There are modules for 1, 5, and 10 MHz sine wave outputs at preset amplitudes (385-4007).

Low Phase noise versions are also available (385-4036). For the GSync low profile/ low phase noise modules are available as well: (385-4046, and 385-4048).

The 385-4009-xx provides 5 or 10 MHz RS-422 outputs.

The 385-4010-xx provides TTL outputs in 1 PPS, 1 MHz, 5 MHz, or 10 MHz.

The 385-4010-01, -02 versions provide 5 or 10 MHz TTL and ECL outputs

The 385-4011-xx provides 5 or 10 MHz fiber optic outputs.

T1/E1 Output Modules

The T1/E1 Output Modules (385-4034) come in four possible configurations: RJ-45, BNC, DE9, or wire-wrap connections.

Clock Rate Output Modules

Clock Rate Modules (385-4016-01, 385-4029-01, 385-4030) provide a user-selected frequency output between 8 kHz and 2048 kHz in 8 kHz increments. In addition, the 385-4068 and 385-4069 N.8 Clock Rate Modules will provide a range from 8 kHz to 8192 kHz. There are modules available that offer RS-422, TTL, or fiber optic outputs.

Frequency Synthesizer

A Frequency Synthesizer Module (385-4039) provides a user-selected frequency output in sine wave or TTL outputs from 200 Hz to 30 MHz.

Pulse Rate Outputs

The 385-4033-02 is programmable via dipswitch on the module for pulse output of 1 PPS, 10 PPS, 100 PPS, 1 kPPS, 10 kPPS, 100 kPPS, 1 MPPS, or 10 MHz

Time Code Output Modules

There are three configurations of Time Code Output Modules available. Each provides either AC or DC IRIG code outputs:

The 385-4020-11 offers four IRIG/BNC outputs

The 385-4020-12 has two IRIG/BNC outputs an RS-232 TOD outputs

The 385-4020-13 provides two IRIG/BNC outputs and three RS-422 DC shift code outputs via a DE9 connector.

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Multiple Output Module 385-4067

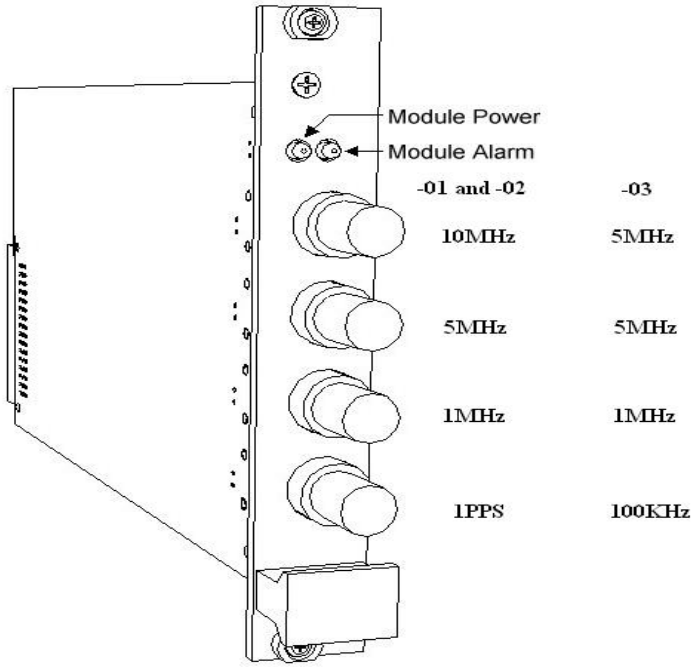
The Multiple Output Module provides either 1 PPS, 100KHz, 1 MHz, 5 MHz or 10 MHz outputs on its four BNC connectors. Modules can be installed in any slot from 3 through 15. For GSync, the module may be installed in any of the four available slots. Each module is “hot swappable”. It can be removed or installed without removing power from the CommSync II System or interrupting operations. Each module contains a VCXO and the necessary logic to minimize the effects of a fault induced switchover.

2.1 LED Status Indicators

The module’s LEDs indicate the status of the module.

- The Green LED indicates power to the module.
- The Red LED is the Alarm indicator that illuminates when there is a fault in the reference signal from the online GTF module and/or the module’s VCXO.

  The Red LED may blink once per second for several seconds at start up.



2.2 Output Configurations

The module provides output signals at a frequency indicated in the following table.

Output Configurations				
Dash Number	Channel	Frequency	Waveform	Output Level
-01	1	10 MHz	Sinusoidal	13 +4, -1 dBm
	2	5 MHz	Sinusoidal	
	3	1 MHz	Sinusoidal	
	4	1 PPS	2 mS pulse	TTL
-02	1	10 MHz	Sinusoidal	6 +3, -1 dBm
	2	5 MHz	Sinusoidal	
	3	1 MHz	Sinusoidal	
	4	1 PPS	2 mS pulse	TTL
-03	1	5 MHz	Sinusoidal	13 +4, -1 dBm
	2	5 MHz	Sinusoidal	
	3	1 MHz	Sinusoidal	
	4	100KHz	Sinusoidal	

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2.3 Status

The status of the Dual Low Phase Noise Sine Wave Output Module can be obtained from the GTF module SSTA message or viewed from the Front Panel display (Menu 8). The status message consists of an identification number (first byte) in hex format and a bus status message (second byte).

2.3.1 Status Message

Dash Number	ID	Status
-01 -02 -03	0x70	Bit7=Synchronization Fault Bit6=Frequency In Fault Bit5=Osc. End of Life Fault, indicates the control voltage to the oscillator is out of useable range.

2.3.2 Front Panel Display (Example)

```
Slot 5  Multiple Outputs      0x70 ≡
Status: 0x00 No Faults
```

2.3.3 Commands

There are no commands specific to this module.

2.4 Specifications

The output signals are synchronized to the 10 MHz signal generated by the system's online GTF module; therefore, the output signals have the same accuracy and stability as the online GTF module's generated signal connected to the module through the system's passive backplane. (See CommSync II User's Manual (385-8000) or GSync User's Manual (391-8000) for accuracy and stability information on the GTF/DTF.)

Unless otherwise stated, the following specifications apply when the internal oscillator has been disciplined for at least 2 days.

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Frequency .....1 PPS, 100KHz, 1 MHz, 5 MHz, or 10 MHz per Config Table
Number of Outputs ..... 4 total
Connector Type .....BNC female
1 PPS Output Characteristics (-01 and -02)
- Wave Shape ..... Pulse
- Pulse Width .....2 mS
- Synchronization Reference .....UTC
- Synchronization..... Rising (leading) edge on-time
- Output Drive
  - High Level ..... ≥ +4.0 V into 50 Ω load
  - Low Level ..... ≤ +0.2 V into 50 Ω load

100KHz (-03 only) /1MHz/5MHz/10 MHz (-01, -02) Output Characteristics
- Wave Shape ..... Sinusoid
- Amplitude into 50 Ω
  - 385-4067-01, -03 ..... 13 +4, -1 dBm
  - 385-4067-02 ..... 6 +3, -1 dBm
- Harmonics ..... < -50 dBc
- Spurious Noise..... < -60 dBc
- Coupling .....AC

Source Impedance .....50 Ω nominal
Protection .....Short circuit proof
Allan Variance (Based upon GTF OSC type):

	Rubidium GTF	OCXO GTF
1 Sec	< 3E-11	< 1E-11
10 Sec	< 1E-11	< 1E-11
100 Sec	< 3E-12	< 1E-10

Phase Noise (5 MHz Output) (typical):
- @ 1 Hz ..... < -90 dBc/Hz
- @ 10 Hz..... < -105 dBc/Hz
- @ 100 Hz..... < -125 dBc/Hz
- @ 1 kHz ..... < -135 dBc/Hz
- @ 10 kHz ..... < -145 dBc/Hz

Phase Noise (10 MHz Output) (typical):
- @ 1 Hz ..... < -85 dBc/Hz
- @ 10 Hz..... < -100 dBc/Hz
- @ 100 Hz..... < -120 dBc/Hz
- @ 1 kHz ..... < -135 dBc/Hz
- @ 10 kHz ..... < -145 dBc/Hz

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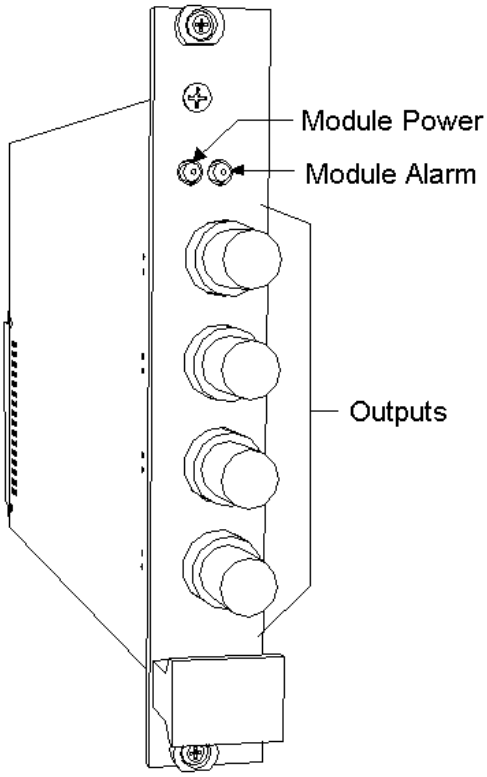
Sine Wave Output Module 385-4007

The Sine Wave Output Module provides 5 MHz and/or 10 MHz sine wave frequency outputs. Modules can be installed in any slot from 3 through 15 (slots 1 through 4 in GSync). Each module is "hot swappable". It can be removed or installed without removing power from the CommSync II System or interrupting operations. Each module contains a VCXO and the necessary logic to minimize the effects of a fault induced switchover.

2.1 LED Status Indicators

The module's LEDs indicate the status of the module.

- The Green LED indicates power to the module.
- The Red LED is the Alarm indicator that illuminates when there is a fault in the reference signal from the online GTF module and/or the module's VCXO.



2.2 Output Configurations

The module provides four 50 Ω sine wave output signals at a frequency of either 5 MHz or 10 MHz. The following matrix indicates which dash number produces which output frequency and output level:

MODULE CONFIGURATION		
Dash Number	Output Frequency	Output Power
-01	5 MHz	13 dBm +4/-1 dBm
-02	10 MHz	13 dBm +4/-1 dBm
-03	5 MHz	6 dBm +3/-1 dBm
-04	10 MHz	6 dBm +3/-1 dBm
-10	1 MHz	13 dBm +4/-1 dBm
-11	1 MHz	6 dBm +3/-1 dBm

2.3 Status

The status of the Sine Wave Output Module can be obtained from the GTF module SSTA message or viewed from the Front Panel display (Menu 8). The status message consists of an identification number (first byte) in hex format and a bus status message (second byte).

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2.3.1 Status Message

Dash Number	ID	Status
-01	0x10	Bit6=Frequency Output Fault Bit7=Frequency Input Fault
-02	0x11	
-03	0x12	
-04	0x13	
-05	0x12	
-06	0x13	
-10	0x23	
-11	0x24	

2.3.2 Front Panel Display (Example)

```
Slot 4  5MHz 13dB Sine Output   0x10  ≡
Status: 0x00 No Faults
```

2.3.3 Commands

There are no commands specific to the Sine Wave Module.

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2.4 Specifications

The output signals are synchronized to the 10 MHz signal generated by the system's online GTF Module; therefore, the output signals have the same accuracy and stability as the online GTF Module's generated signal connected to the module through the system's passive backplane.

All versions provide four (4) output signals through BNC connectors. The difference between the versions is the output signal frequency and the output signal level.

Number of Outputs 4
Connector Type ..... BNC female
Frequency
- 385-4007-01, 385-4007-03, and 385-4007-05 ..... 5 MHz
- 385-4007-02, 385-4007-04, and 385-4007-06 ..... 10 MHz
- 385-4007-10 and 385-4007-11 ..... 1 MHz

Wave Shape ..... Sinusoid
Amplitude into 50 Ω
- 385-4007-01, 385-4007-02, 385-4007-10 ..... 13 +4, -1 dBm
- 385-4007-03, 385-4007-04, 385-4007-11 ..... 6 +3, -1 dBm
- 385-4007-05, 385-4007-06 ..... 0 +3, -1 dBm

Harmonics ..... < -50 dBc
Spurious Noise ..... <- 60 dBc
Coupling ..... AC
Source Impedance ..... 50 Ω nominal
Protection ..... Short circuit proof
Allan Variance (Based upon GTF OSC type):

	Rubidium GTF	OCXO GTF
1 Sec	< 3E-11	< 1E-11
10 Sec	< 1E-11	< 1E-11
100 Sec	< 3E-12	< 1E-10

Phase Noise (5 MHz Module) (typical):
- @ 1 Hz ..... < -90 dBc/Hz
- @ 10 Hz ..... < -105 dBc/Hz
- @ 100 Hz ..... < -125 dBc/Hz
- @ 1 kHz ..... < -135 dBc/Hz
- @ 10 kHz ..... < -145 dBc/Hz

Phase Noise (10 MHz Module) (typical):
- @ 1 Hz ..... < -85 dBc/Hz
- @ 10 Hz ..... < -105 dBc/Hz
- @ 100 Hz ..... < -120 dBc/Hz
- @ 1 kHz ..... < -135 dBc/Hz
- @ 10 kHz ..... < -140 dBc/Hz

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Low Phase Noise Sine Wave Output Module 385-4036

The Low Phase Noise Sine Wave Output Modules provide either 5 MHz or 10 MHz low phase noise frequency outputs. Modules can be installed in any slot from 3 through 15 (slots 1 through 4 in GSync). Each module is "hot swappable". It can be removed or installed without removing power from the CommSync II System or interrupting operations. Each module contains a VCXO and the necessary logic to minimize the effects of a fault induced switchover.

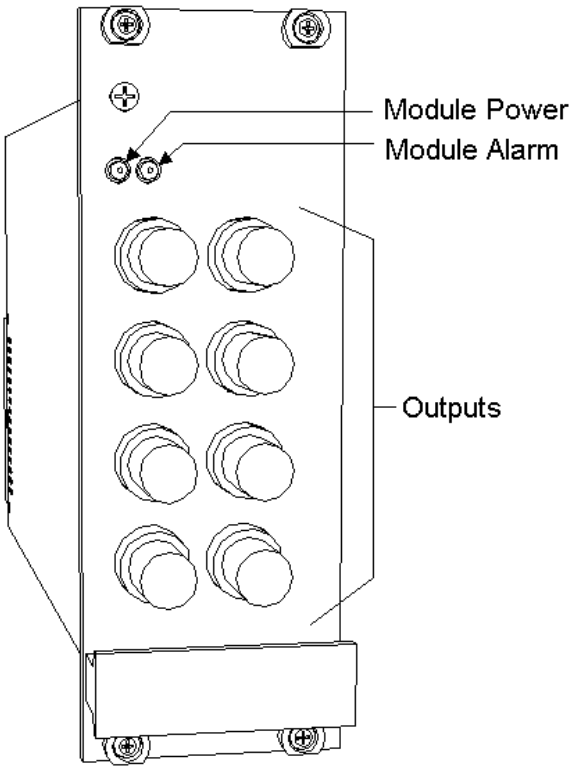
Note: Due to its size, this module is not available for the GSync system. The alternate Low Phase Noise Module is the 385-4046.

2.1 LED Status Indicators

The module's LEDs indicate the status of the module.

- The Green LED indicates power to the module.
- The Red LED is the Alarm indicator that illuminates when there is a fault in the reference signal from the online GTF module and/or the module's VCXO.

  The Red LED may blink once per second for a short time at start up.



2.2 Output Configurations

The module provides eight 50 Ω sine wave output signals at a frequency of either 5 MHz or 10 MHz at different output levels. The following matrix indicates which dash number produces which output frequency and output level:

MODULE CONFIGURATION		
Dash Number	Output Frequency	Output Power
-01	5 MHz	13 dBm +4/-1 dBm
-02	10 MHz	13 dBm +4/-1 dBm
-03	5 MHz	6 dBm +3/-1 dBm
-04	10 MHz	6 dBm +3/-1 dBm
-05	5 MHz	0 dBm +2/-0 dBm
-06	10 MHz	0 dBm +2/-0 dBm

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2.3 Status

The status of the Low Phase Noise Sine Wave Output Module can be obtained from the GTF module SSTA message or viewed from the Front Panel display (Menu 8). The status message consists of an identification number (first byte) in hex format and a bus status message (second byte).

2.3.1 Status Message

Dash Number	ID	Status
-01	0x1A	Bit7=Synchronization Fault Bit6=Frequency In Fault Bit5=Osc. End of Life Fault This bit indicates the control voltage to the oscillator is out of the useable range.
-02	0x1B	
-03	0x1C	
-04	0x1D	
-05	0x1E	
-06	0x1F	
-07	0x1A	
-08	0x1C	
-09	0x1F	

2.3.2 Front Panel Display (Example)

```
Slot 5  5MHz Low Noise 0dBm Sine  0x1E ≡
Status: 0x00 No Faults
```

2.3.3 Commands

There are no commands specific to this module.

2.4 Power Considerations

The Low Phase Noise Sine Wave Output Module contains a double-oven oscillator. This oscillator, along with all the other oscillators in the system, draws a large amount of current when the system starts. Under normal circumstances, this is not an issue. However, if multiple Low Phase Noise Sine Wave Output Modules are installed, they may trigger the power supply's overload protection. The typical symptom is that approximately 3 seconds after applying power, the power supply will cycle off, then back on.

A shunt has been installed on the board that insures that power is applied immediately to the module when power is applied to the system. However, if the system has more than two Low Phase Noise Sine Wave Output Modules, it may be necessary to remove this shunt. This will delay the application of power to the module for approximately 4.5 seconds, allowing the power to stabilize before activating the oscillators in the modules.

Refer to Figure 2 for shunt location.

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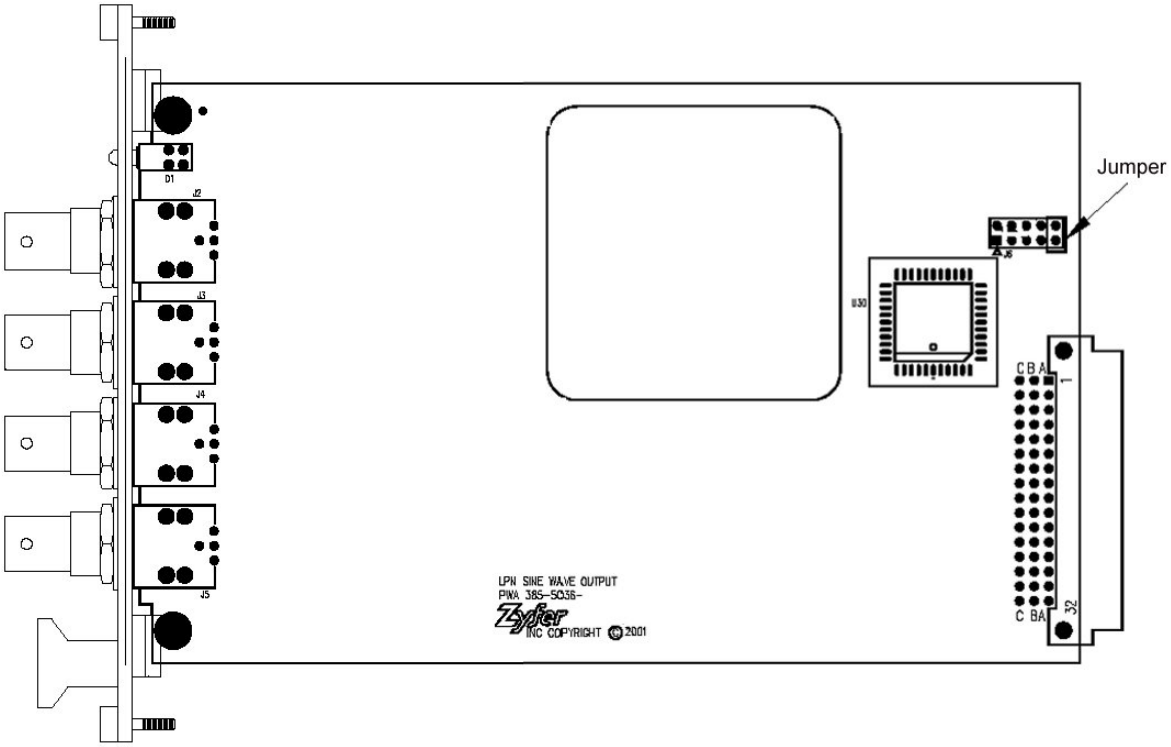

Figure 2 Low Phase Noise Module Jumper Location

2.5 Specifications

The output signals are synchronized to the 10 MHz signal generated by the system's online GTF module; therefore, the output signals have the same accuracy and stability as the online GTF module's generated signal connected to the module through the system's passive backplane.

Unless otherwise stated, the following specifications apply when the internal oscillator has been disciplined for at least 2 days.

All versions provide eight (8) output signals through BNC connectors. The primary difference between the versions is the output signal frequency and the output signal level.

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Number of Outputs 8
Connector Type ..... BNC female
Frequency
385-4036-01, -03, -05 ..... 5 MHz
385-4036-02, -04, -06 ..... 10 MHz
Wave Shape ..... Sinusoid
Amplitude into 50 Ω
385-4036-01, -02 ..... 13 +4, -1 dBm
385-4036-03, -04 ..... 6 +3, -1 dBm
385-4036-05, -06 ..... 0 +2, -0 dBm
Harmonics ..... < -50 dBc
Spurious Noise ..... < -60 dBc
Coupling ..... AC
Source Impedance ..... 50 Ω nominal
Protection ..... Short circuit proof

Allan Variance (Based upon GTF OSC type):

	Rubidium GTF	OCXO GTF
1 Sec	< 3E-11	< 1E-11
10 Sec	< 1E-11	< 1E-11
100 Sec	< 3E-12	< 1E-10

Phase Noise (5 MHz Module) (typical):

	Rubidium GTF	OCXO GTF
@ 1 Hz	< -100 dBc/Hz	< -105 dBc/Hz
@ 10 Hz	< -125 dBc/Hz	< -130 dBc/Hz
@ 100 Hz	< -138 dBc/Hz	< -143 dBc/Hz
@ 1 kHz	< -148 dBc/Hz	< -153 dBc/Hz
@ 10 kHz	< -150 dBc/Hz	< -155 dBc/Hz

Phase Noise (10 MHz Module) (typical):

	Rubidium GTF	OCXO GTF
@ 1 Hz	< -100 dBc/Hz	< -100 dBc/Hz
@ 10 Hz	< -125 dBc/Hz	< -125 dBc/Hz
@ 100 Hz	< -137 dBc/Hz	< -137 dBc/Hz
@ 1 kHz	< -147 dBc/Hz	< -147 dBc/Hz
@ 10 kHz	< -147 dBc/Hz	< -147 dBc/Hz

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Low Profile Low Phase Noise Sine Wave Output Module 385-4046

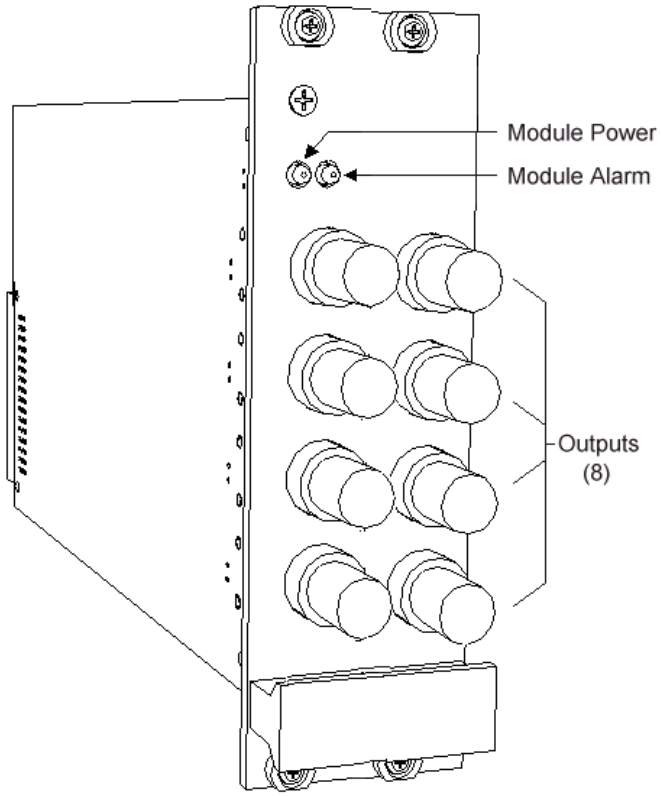
The Low Phase Noise Sine Wave Output Modules provide a 1 MHz, 5 MHz, or 10 MHz low phase noise frequency outputs. Modules can be installed in any slot from 3 through 15. For GSync, the module may be installed in either Slot 2 or Slot 4. Each module is "hot swappable". It can be removed or installed without removing power from the CommSync II System or interrupting operations. Each module contains a VCXO and the necessary logic to minimize the effects of a fault induced switchover.

2.1 LED Status Indicators

The module's LEDs indicate the status of the module.

- The Green LED indicates power to the module.
- The Red LED is the Alarm indicator that illuminates when there is a fault in the reference signal from the online GTF module and/or the module's VCXO.

  The Red LED may blink once per second for a short time at start up.



2.2 Output Configurations

The module provides eight 50 Ω sine wave output signals at a frequency of either 5 MHz or 10 MHz at different output levels. The following matrix indicates which dash number produces which output frequency and output level:

MODULE CONFIGURATION		
Dash Number	Output Frequency	Output Power
-01	5 MHz	13 dBm +4/-1 dBm
-02	10 MHz	13 dBm +4/-1 dBm
-03	5 MHz	6 dBm +3/-1 dBm
-04	10 MHz	6 dBm +3/-1 dBm
-10	1 MHz	13 dBm +4/-1 dBm
-11	1 MHz	6 dBm +3/-1 dBm

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2.3 Status

The status of the Low Phase Noise Sine Wave Output Module can be obtained from the GTF module SSTA message or viewed from the Front Panel display (Menu 8). The status message consists of an identification number (first byte) in hex format and a bus status message (second byte).

2.3.1 Status Message

Dash Number	ID	Status
-01	0x1A	Bit7=Synchronization Fault Bit6=Frequency In Fault Bit5=Osc. End of Life Fault This bit indicates the control voltage to the oscillator is out of the useable range.
-02	0x1B	
-03	0x1C	
-04	0x1D	
-10	0x25	
-11	0x26	

2.3.2 Front Panel Display (Example)

```
Slot 5  5MHz Low Noise 13dBm Sine  0x1A ≡
Status: 0x00 No Faults
```

2.3.3 Commands

There are no commands specific to this module.

2.4 Specifications

The output signals are synchronized to the 10 MHz signal generated by the system's online GTF module; therefore, the output signals have the same accuracy and stability as the online GTF module's generated signal connected to the module through the system's passive backplane.

Unless otherwise stated, the following specifications apply when the internal oscillator has been disciplined for at least 2 days.

All versions provide eight (8) output signals through BNC connectors. The primary difference between the versions is the output signal frequency and the output signal level.

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Number of Outputs 8
Connector Type ..... BNC female
Frequency
- 385-4046-01, -03..... 5 MHz
- 385-4046-02, -04..... 10 MHz
- 385-4046-10, -11..... 1 MHz

Wave Shape ..... Sinusoid
Amplitude into 50 Ω
- 385-4046-01, -02, -10 ..... 13 +4, -1 dBm
- 385-4046-03, -04, -11 ..... 6 +3, -1 dBm

Harmonics ..... < -50 dBc
Spurious Noise ..... < -60 dBc
Coupling ..... AC
Source Impedance ..... 50 Ω nominal
Protection ..... Short circuit proof
Allan Variance (Based upon GTF OSC type):

	Rubidium GTF	OCXO GTF
1 Sec	< 3E-11	< 1E-11
10 Sec	< 1E-11	< 1E-11
100 Sec	< 3E-12	< 1E-10

Phase Noise (5 MHz Module) (typical):

	Rubidium GTF	OCXO GTF
@ 1 Hz	< -90 dBc/Hz	< -90 dBc/Hz
@ 10 Hz	< -120 dBc/Hz	< -120 dBc/Hz
@ 100 Hz	< -135 dBc/Hz	< -135 dBc/Hz
@ 1 kHz	< -145 dBc/Hz	< -145 dBc/Hz
@ 10 kHz	< -150 dBc/Hz	< -150 dBc/Hz

Phase Noise (10 MHz Module) (typical):

	Rubidium GTF	OCXO GTF
@ 1 Hz	< -90 dBc/Hz	< -90 dBc/Hz
@ 10 Hz	< -120 dBc/Hz	< -120 dBc/Hz
@ 100 Hz	< -135 dBc/Hz	< -135 dBc/Hz
@ 1 kHz	< -145 dBc/Hz	< -145 dBc/Hz
@ 10 kHz	< -150 dBc/Hz	< -150 dBc/Hz

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Low Profile Dual Output Low Phase Noise Sine Wave Output Module 385-4048

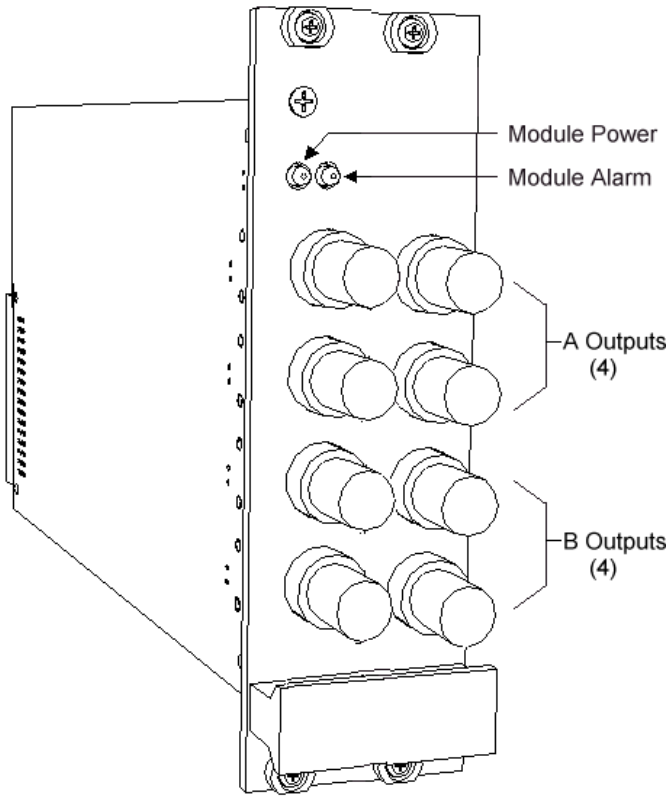
The Low Profile/ Dual Output, Low Phase Noise Sine Wave Output Modules provide two frequencies, 1 and 5 MHz, or 5 and 10 MHz (4 outputs each frequency) low phase noise frequency outputs. Modules can be installed in any slot from 3 through 15. For GSync, the module may be installed in either Slot 2 or Slot 4. Each module is "hot swappable". It can be removed or installed without removing power from the CommSync II System or interrupting operations. Each module contains a VCXO and the necessary logic to minimize the effects of a fault induced switchover.

2.1 LED Status Indicators

The module's LEDs indicate the status of the module.

- The Green LED indicates power to the module.
- The Red LED is the Alarm indicator that illuminates when there is a fault in the reference signal from the online GTF module and/or the module's VCXO.

  The Red LED may blink once per second for a short time at start up.



2.2 Output Configurations

The module provides two sets of four 50 Ω sine wave output signals at a frequency of either 1, 5, or 10 MHz at different output levels. The following matrix indicates which dash number produces which output frequency and output level:

MODULE CONFIGURATION			
Dash Number	Output 'A' Frequency	Output 'B' Frequency	Output Power
-01	5 MHz	1 MHz	13 dBm +4, -1 dBm
-02	10 MHz	5 MHz	13 dBm +4, -1 dBm
-03	5 MHz	1 MHz	6 dBm +3, -1 dBm
-04	10 MHz	5 MHz	6 dBm +3, -1 dBm
-05	5 MHz	1 MHz	13 dBm ± 2 dBm

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2.3 Status

The status of the Dual Low Phase Noise Sine Wave Output Module can be obtained from the GTF module SSTA message or viewed from the Front Panel display (Menu 8). The status message consists of an identification number (first byte) in hex format and a bus status message (second byte).

2.3.1 Status Message

Dash Number	ID	Status
-01	0x2C	Bit7=Synchronization Fault Bit6=Frequency In Fault Bit5=Osc. End of Life Fault, indicates the control voltage to the oscillator is out of useable range.
-02	0x2D	
-03	0x2E	
-04	0x2F	
-05	0x2C	

2.3.2 Front Panel Display (Example)

```
Slot 5  1/5MHz Low Noise Sine      0x2C ≡
Status: 0x00 No Faults
```

2.3.3 Commands

There are no commands specific to this module.

2.4 Specifications

The output signals are synchronized to the 10 MHz signal generated by the system's online GTF module; therefore, the output signals have the same accuracy and stability as the online GTF module's generated signal connected to the module through the system's passive backplane.

Unless otherwise stated, the following specifications apply when the internal oscillator has been disciplined for at least 2 days.

All versions provide four 'A' outputs and four 'B' output signals through BNC connectors. The primary difference between the versions is the output signal frequency and the output signal level.

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Number of Outputs .....8: 4 'A' outputs/4 'B' outputs
Connector Type .....BNC female
Frequency
385-4048-01, -03, -05 ..... 1MHz 'B' and 5 MHz 'A'
385-4048-02, -04..... 5MHz 'B' and10 MHz 'A'
Wave Shape ..... Sinusoid
Amplitude into 50 Ω
385-4048-01, -02..... 13 +4, -1 dBm
385-4048-03, -04..... 6 +3, -1 dBm
385-4048-05..... 13 ± 2 dBm
Harmonics ..... < -50 dBc
Spurious Noise ..... < -60 dBc
Coupling .....AC
Source Impedance .....50 Ω nominal
Protection .....Short circuit proof
Allan Variance (Based upon GTF OSC type):

	Rubidium GTF	OCXO GTF
1 Sec	< 3E-11	< 1E-11
10 Sec	< 1E-11	< 1E-11
100 Sec	< 3E-12	< 1E-10

Phase Noise (5 MHz Output) (typical):

	Rubidium GTF	OCXO GTF
@ 1 Hz	< -90 dBc/Hz	< -90 dBc/Hz
@ 10 Hz	< -120 dBc/Hz	< -120 dBc/Hz
@ 100 Hz	< -135 dBc/Hz	< -135 dBc/Hz
@ 1 kHz	< -145 dBc/Hz	< -145 dBc/Hz
@ 10 kHz	< -150 dBc/Hz	< -150 dBc/Hz

Phase Noise (10 MHz Output) (typical):

	Rubidium GTF	OCXO GTF
@ 1 Hz	< -90 dBc/Hz	< -90 dBc/Hz
@ 10 Hz	< -120 dBc/Hz	< -120 dBc/Hz
@ 100 Hz	< -135 dBc/Hz	< -135 dBc/Hz
@ 1 kHz	< -145 dBc/Hz	< -145 dBc/Hz
@ 10 kHz	< -150 dBc/Hz	< -150 dBc/Hz

Phase Noise (5 MHz Output for -05 only) (typical):

	OCXO GTF
@ 1 Hz	< -90 dBc/Hz
@ 10 Hz	< -125 dBc/Hz
@ 100 Hz	< -140 dBc/Hz
@ 1 kHz	< -145 dBc/Hz
@ 10 kHz	< -150 dBc/Hz

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Phase Aligned, Dual Output, LPN Sine Wave Module 385-4079

The Phase aligned, Dual Output, Low Phase Noise Sine Wave Modules provide two frequencies 5 and 10 MHz (4 outputs each) low phase noise frequency outputs. These outputs are phase aligned to the System 1PPS output.

Modules can be installed in any slot from 3 through 15. For GSync, the module may be installed in either Slot 2 or Slot 4.

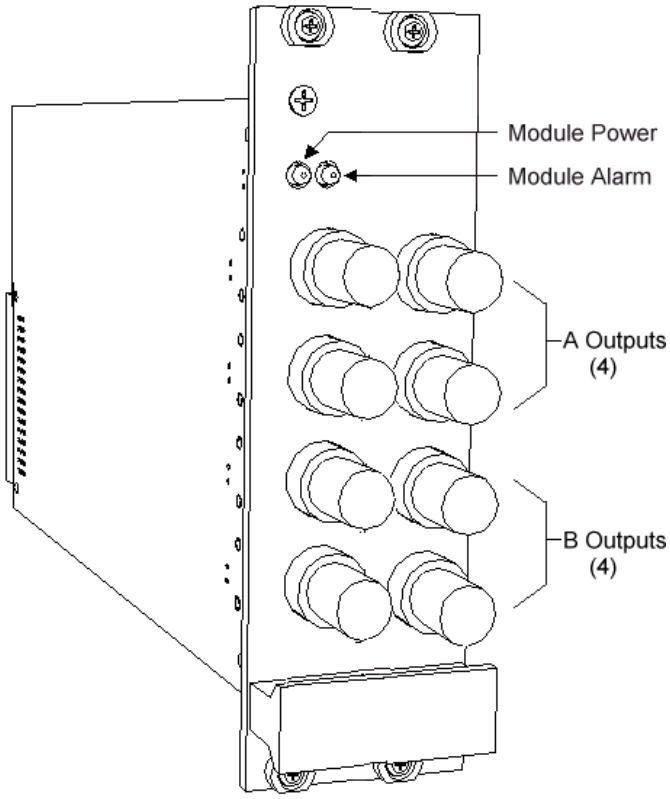
Each module is “hot swappable”. It can be removed or installed without removing power from the CommSync II System or interrupting operations. Each module contains a OCXO and the necessary logic to minimize the effects of a fault induced switchover.

2.1 LED Status Indicators

The module’s LEDs indicate the status of the module.

- The Green LED indicates power to the module.
- The Red LED is the Alarm indicator that illuminates when there is a fault in the reference signal from the online GTF module and/or the module’s OVCXO, or if the Phase alignment is out of tolerance

  The Red LED will be solid on until the internal PLL is locked to the input frequency (GTF) and will blink for a short time thereafter while the Phase Alignment is verified.



2.2 Output Configurations

The module provides two sets of four 50 Ω sine wave output signals at a frequency of either 1, 5, or 10 MHz at different output levels. The following matrix indicates which dash number produces which output frequency and output level:

MODULE CONFIGURATION			
Dash Number	Output ‘A’ Frequency	Output ‘B’ Frequency	Output Power
-02	10 MHz	5 MHz	13 dBm +4, -1 dBm

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2.3 Status

The status of the Phase Aligned Dual LPN Sine Wave Output Module can be obtained from the GTF module SSTA message or viewed from the Front Panel display (Menu 8). The status message consists of an identification number (first byte) in hex format and a bus status message (second byte).

2.3.1 Status Message

Dash Number	ID	Status
		Bit7=Missing Reference Fault Bit6=OSC Output Fault Bit5=Osc. Lock/End of Life Fault, indicates the control voltage to the oscillator is out of useable range. Bit4=10Mhz Alignment fault Bit3=Module Fault Bit2-0= set to 0
-02	0x72	

2.3.2 Front Panel Display (Example)

```
Slot 5  Dual Aligned LPN          0x72 ≡
Status: 0x00 No Faults
```

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2.4 Calibration

All CommSyncII/GSync modules are locked (Frequency Locked) to the GTF output and require no calibration. The Phase aligned, Dual Output, Low Phase Noise Sine Wave Module is (Phase Aligned) calibrated at the factory as a system. Calibration should only be required if a module is replaced in a chassis. The process below will verify the alignment of the frequency outputs with the System 1PPS outputs and provide the methods for Calibration in a system.

If Calibration is required:

Equipment needed: 2 Channel Storage Scope., Set-up
Connect Channel 1 to 10MHz sine-wave output of the Phase Aligned module
Connect Channel 2 (Trigger) to 1PPS output (385-4010-05 recommended).
Trigger on rising (on-time) edge of the Channel2 (1PPS).
Set horizontal Scale to 10nS/Div (Minimum)

Note : monitor Stability with Fault LED

On	Module fault, or PLL not locked
Blink	Phase Adjust final adjustments
Off	Output Stable,

1. Read the current PA_Dly setting, and issue the following command to turn AutoCal off.
   $PHAC,7,0*<cr|lf>
   Response:
   $PHAC,7,0,50,1.055,1.057*<cs|cr|lf>

2. On the Scope, Measure time difference from the 10MHz rising edge to the rising edge of the 1PPS sine wave output. [assume the 10MHz is 32nS ahead of the 1PPS)
   Note: If 10MHz rising edge falls after the 1PPS edge, the number would be negative.

3. Add the measurement from step 1 [+32nS] to the PA_Dly reading [50] (50+32=82)
   Send following command set the new delay value [82]:
   $PHAC,7,0,82*<cr|lf>
   Response:
   $PHAC,7,0,82,1.055,1.057*<cs|cr|lf>

4. Wait for the board to become stable (RED Fault LED off) and send the following command to read the Phase Detector voltage.
   $PHAC,7*<cr|lf>
   Response:
   $PHAC,7,0,82,2.007,1.057*<cs|cr|lf>

5. Send the following command to set the new set point: (2.007)
   $PHAC,7,1,82,2.007*<cr|lf>
   Response:
   $PHAC,7,0,82,2.007,2.007*<cs|cr|lf>

6. Verify time difference from 1PPS rising edge to the rising edge of the 10MHz sine wave output is less than <2nS. If not repeat step 2 -> 5.

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2.5 Specifications

The output signals are synchronized to the 10 MHz signal generated by the system's online GTF module; therefore, the output signals have the same accuracy and stability as the online GTF module's generated signal connected to the module through the system's passive backplane.

Unless otherwise stated, the following specifications apply when the internal oscillator has been disciplined for at least 2 days.

All versions provide four 'A' outputs and four 'B' output signals through BNC connectors. The primary difference between the versions is the output signal frequency and the output signal level.

Number of Outputs.....8: 4 'A' outputs/4 'B' outputs
- Connector Type .....BNC female
- Frequency
  - 385-4079-02..... 5MHz 'B' and 10 MHz 'A'
- Wave Shape..... Sinusoid
- Amplitude into 50 Ω
  - 385-4079-02..... 13 +4, -1 dBm
- Phase Alignment (with system 1PPS output) ..... +/-15nS
- Output Alignment (same frequency) ..... +/-5nS
- Harmonics ..... < -50 dBc
- Spurious Noise ..... < -60 dBc
- Coupling .....AC
- Source Impedance .....50 Ω nominal
- Protection .....Short circuit proof

Allan Variance (Based upon GTF OSC type):

	Rubidium GTF	OCXO GTF
1 Sec	< 3E-11	< 1E-11
10 Sec	< 1E-11	< 1E-11
100 Sec	< 3E-12	< 1E-10

Phase Noise (5 MHz Output) (typical):

	Rubidium GTF	OCXO GTF
@ 1 Hz	< -90 dBc/Hz	< -90 dBc/Hz
@ 10 Hz	< -120 dBc/Hz	< -120 dBc/Hz
@ 100 Hz	< -135 dBc/Hz	< -135 dBc/Hz
@ 1 kHz	< -145 dBc/Hz	< -145 dBc/Hz
@ 10 kHz	< -150 dBc/Hz	< -150 dBc/Hz

Phase Noise (10 MHz Output) (typical):

	Rubidium GTF	OCXO GTF
@ 1 Hz	< -90 dBc/Hz	< -90 dBc/Hz
@ 10 Hz	< -120 dBc/Hz	< -120 dBc/Hz
@ 100 Hz	< -135 dBc/Hz	< -135 dBc/Hz
@ 1 kHz	< -145 dBc/Hz	< -145 dBc/Hz
@ 10 kHz	< -150 dBc/Hz	< -150 dBc/Hz

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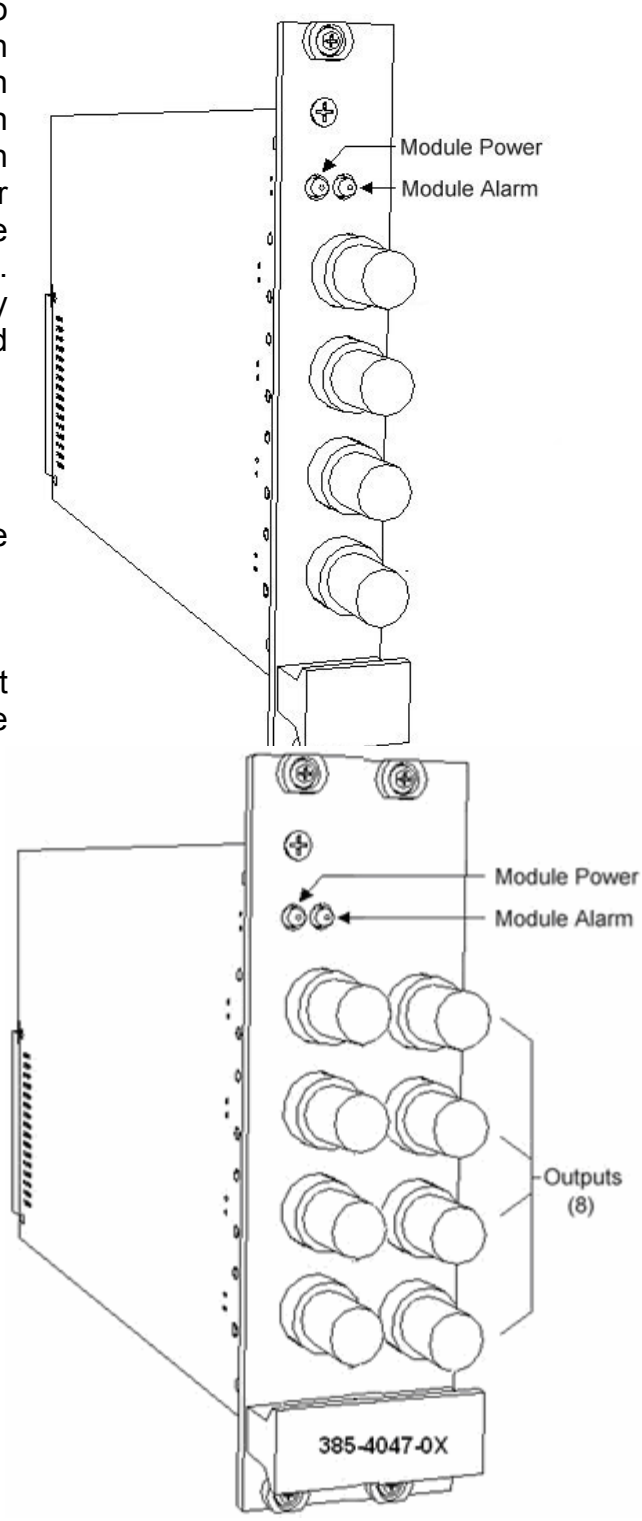
High Frequency Sine Wave Output Module 385-4047

The High Frequency Sine Wave Output Module provides four 100 MHz outputs or eight 65.536,64.8,72 or 105 MHz outputs. The 100 MHz modules can be installed in any slot from 3 through 15. The other modules occupy two slots and can be installed in any slot from 4 through 15. For GSync, these modules may be installed in either Slot 2 or Slot 4, while the 100 MHz version may be installed in any of the 4 available slots. Each module is "hot swappable". It can be removed or installed without removing power from the CommSync II System or interrupting operations. Each module contains a VCXO and the necessary logic to minimize the effects of a fault induced switchover.



2.1 LED Status Indicators

The module's LEDs indicate the status of the module.

- The Green LED indicates power to the module.
- The Red LED is the Alarm indicator that illuminates when there is a fault in the reference signal from the online GTF module and/or the module's VCXO.

  The LED blinks once per second at start up. After sync is achieved, it will blink to indicate that the module's oscillator is nearing its end of life point.

2.2 Output Configurations

The module provides 50 Ω sine wave output signals at a frequency of either 100 MHz or 65.536 MHz. The following matrix indicates which dash number produces which output frequency, output level, and number of outputs:

MODULE CONFIGURATION			
Dash Number	Output Frequency	Output Power	Number of Outputs
-01	100 MHz	21 +3, -1 dBm	4
-02	65.536 MHz	10 ± 1 dBm	8
-03	64.800 MHz		
-05	72.000 MHz		
-06	105.00 MHz		

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2.3 Status

The status of the High Frequency Sine Wave Output Module can be obtained from the GTF module SSTA message or viewed from the Front Panel display (Menu 8). The status message consists of an identification number (first byte) in hex format and a bus status message (second byte).

2.3.1 Status Message

Dash Number	ID	Status
-01	0x27	Bit7=Synchronization Fault Bit6=Frequency In Fault Bit5=Osc. End of Life Fault This bit indicates the control voltage to the oscillator is out of the useable range.
-02		
-03		
-05		
-06		

2.3.2 Front Panel Display (Example)

```
Slot 5  High Frequency Sine      0x27 ≡
Status: 0x00 No Faults
```

2.3.3 Commands

There are no commands specific to this module.

2.4 Specifications

The output signals are synchronized to the 10 MHz signal generated by the system's online GTF module; therefore, the output signals have the same accuracy and stability as the online GTF module's generated signal connected to the module through the system's passive backplane.

Unless otherwise stated, the following specifications apply when the internal oscillator has been disciplined for at least 2 days.

All versions provide eight (8) output signals through BNC connectors. The primary difference between the versions is the output signal frequency and the output signal level.

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Number of Outputs
- 385-4047-01 4
- 385-4047-02,-03,-05,-06 8

Connector Type ..... BNC female

Frequency
- 385-4047-01 ..... 100 MHz
- 385-4047-02 ..... 65.536 MHz
- 385-4047-03 ..... 64.8 MHz
- 385-4047-05 ..... 72 MHz
- 385-4047-06 ..... 105 MHz

Wave Shape ..... Sinusoid

Amplitude into 50 Ω
- 385-4047-01 ..... 21 ± 1 dBm
- 385-4047-02,-03,-05, -06 ..... 10 ± 1 dBm

Harmonics ..... < -50 dBc

Spurious Noise ..... < -60 dBc

Coupling ..... AC

Source Impedance ..... 50 Ω nominal

Protection ..... Short circuit proof

Allan Variance (Based upon GTF OSC type):

	Rubidium GTF	OCXO GTF
1 Sec	< 3E-11	< 1E-11
10 Sec	< 1E-11	< 1E-11
100 Sec	< 3E-12	< 1E-10

Phase Noise for 385-4047-01 (typical 100 MHz Output):
- @ 1 Hz ..... < -50 dBc/Hz
- @ 10 Hz ..... < -80 dBc/Hz
- @ 100 Hz ..... < -110 dBc/Hz
- @ 1 kHz ..... < -115 dBc/Hz
- @ 10 kHz ..... < -130 dBc/Hz
- @ 100 kHz ..... < -140 dBc/Hz

Phase Noise for 385-4047-02 (typical 65.536 MHz Output):
- @ 1 Hz ..... < -55 dBc/Hz
- @ 10 Hz ..... < -85 dBc/Hz
- @ 100 Hz ..... < -115 dBc/Hz
- @ 1 kHz ..... < -140 dBc/Hz
- @ 10 kHz ..... < -147 dBc/Hz
- @ 100 kHz ..... < -150 dBc/Hz

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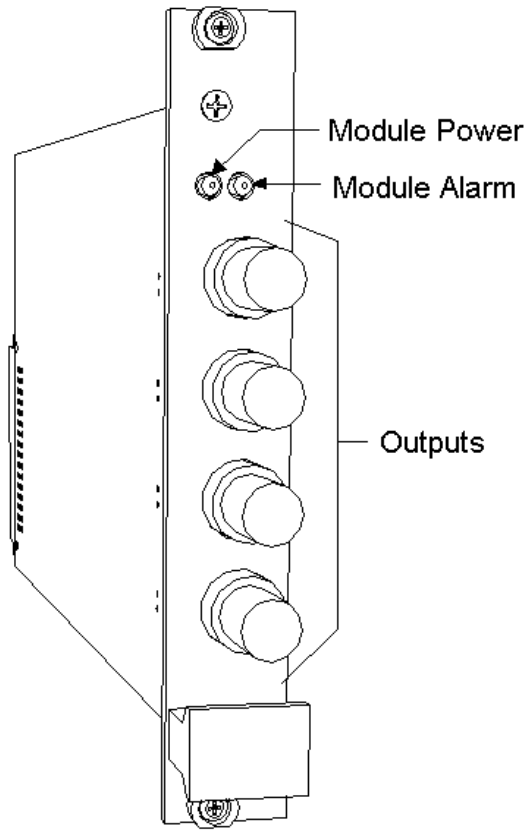
1 PPS TTL Output Module 385-4010-05

The 1 PPS TTL Output Module provides high drive capability 1 PPS outputs. Modules can be installed in any slot from 3 through 15 (slots 1 through 4 in GSync). Each module is “hot swappable”. It can be removed or installed without removing power from the CommSync II System or interrupting operations.

2.1 LED Status Indicators

The module’s LEDs indicate the status of the module.

- The Green LED indicates power to the module.
- The Red LED is the Alarm indicator that illuminates when there is a fault in the 1 PPS reference signal from the online GTF module.



2.2 Output Configurations

The module provides four TTL level signals at a rate of 1 PPS through BNC connectors.

2.3 Status

The status of the 1 PPS TTL Output Module can be obtained from the GTF module SSTA message or viewed from the Front Panel display (Menu 8). The status message consists of an identification number (first byte) in hex format and a bus status message (second byte).

2.3.1 Status Message

ID	Status
0x22	Bit6=Frequency Output Fault Bit7=Frequency Input Fault

2.3.2 Front Panel Display (Example)

```
Slot 3  Quad 1 PPS TTL Output   0x22
Status: 0x00 No Faults
```

2.3.3 Commands

There are no commands specific to this output module.

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2.4 Specifications

The output signals are synchronized to the 1 PPS generated by the online GTF module; therefore, the output signals have the same accuracy and stability as the online GTF module's generated signal connected to the module through the system's passive backplane.

Number of Outputs 4
Connector Type ..... BNC female
Rate ..... 1 PPS
Wave Shape ..... Pulse
Pulse Width ..... 2 mS
Synchronization Reference ..... UTC
Synchronization ..... Rising (leading) edge on-time
Source Impedance ..... 50 Ω nominal
Output Drive
- High Level ..... ≥ +4.0 V into 50 Ω load
- Low Level ..... ≤ +0.2 V into 50 Ω load

Protection ..... Short circuit proof

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10V 1PPS Output Module 385-4010-06

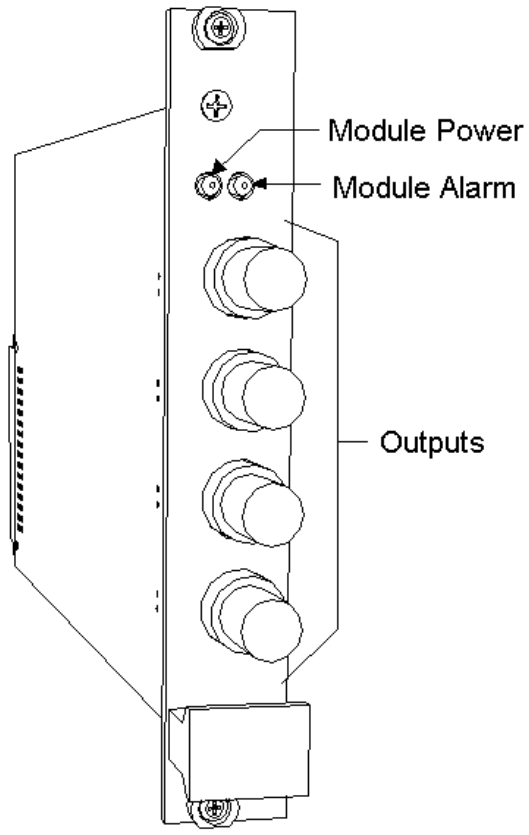
The 10V 1 PPS Output Module provides high drive capability 1 PPS outputs. The output interface is designed to meet the GPS-ICD-060 requirements for 1 PPS output (10 V, 20 µs pulse width, 50 ohm).

Modules can be installed in any slot from 3 through 15 (slots 1 through 4 in GSync). Each module is "hot swappable". It can be removed or installed without removing power from the CommSync II System or interrupting operations.

2.1 LED Status Indicators

The module's LEDs indicate the status of the module.

- The Green LED indicates power to the module.
- The Red LED is the Alarm indicator that illuminates when there is a fault in the 1 PPS reference signal from the online GTF module.



2.2 Output Configurations

The module provides four 10V signals at a rate of 1 PPS through BNC connectors.

2.3 Status

The status of the 10V 1 PPS Output Module can be obtained from the GTF module SSTA message or viewed from the Front Panel display (Menu 8). The status message consists of an identification number (first byte) in hex format and a bus status message (second byte).

2.3.1 Status Message

ID	Status
0x61	Bit7 = Board Fault

2.3.2 Front Panel Display (Example)

```
Slot 3  Pulse Rate Output 0x61   ≡
Status: 0x00
```

2.3.3 Commands

There are no commands specific to this output module.

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2.4 Specifications

The output signals are synchronized to the 1 PPS generated by the online GTF module; therefore, the output signals have the same accuracy and stability as the online GTF module's generated signal connected to the module through the system's passive backplane.

Number of Outputs	4
Connector Type	BNC female
Rate	1 PPS
Wave Shape	Pulse
Pulse Width	20 µS
Synchronization Reference	UTC
Synchronization	Rising (leading) edge on-time
Source Impedance	50 Ω nominal
Output Drive	
High Level	10 V ± 1 Vdc into 50 Ω load
Low Level	0 V ± 1 Vdc into 50 Ω load
Rise Time	< 20 nS
Fall Time	< 1 µS
Protection	Short circuit proof

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10V 1PPM Output Module 385-4010-07

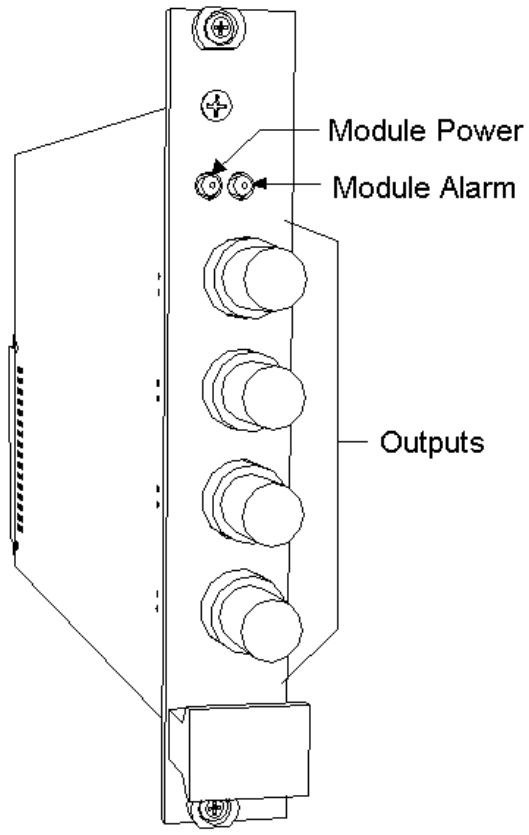
The 10V 1PPM Output Module provides high drive capability 1 PPM outputs. The output interface is designed to meet the GPS-ICD-060 requirements for 1 PPM output (10 V, 20 µs pulse width, 50 ohm).

Modules can be installed in any slot from 3 through 15 (slots 1 through 4 in GSync). Each module is “hot swappable”. It can be removed or installed without removing power from the CommSync II System or interrupting operations.

2.1 LED Status Indicators

The module’s LEDs indicate the status of the module.

- The Green LED indicates power to the module.
- The Red LED is the Alarm indicator that illuminates when there is a fault in the 1 PPS reference signal from the online GTF module.



2.2 Output Configurations

The module provides four 10V signals at a rate of 1 PPM through BNC connectors.

2.3 Status

The status of the 10V 1 PPS Output Module can be obtained from the GTF module SSTA message or viewed from the Front Panel display (Menu 8). The status message consists of an identification number (first byte) in hex format and a bus status message (second byte).

2.3.1 Status Message

ID	Status
0x5C	Bit7 = Board Fault

2.3.2 Front Panel Display (Example)

```
Slot 3  Pulse Rate Output 0x5C  ≡
Status: 0x00
```

2.3.3 Commands

There are no commands specific to this output module.

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2.4 Specifications

The 1PPM output signals are synchronized to the 1 PPS generated by the online GTF module; therefore, the output signals have the same accuracy and stability as the online GTF module's generated signal connected to the module through the system's passive backplane.

Number of Outputs	4
Connector Type	BNC female
Rate	1 PPM
Wave Shape	Pulse
Pulse Width	20 µS
Synchronization Reference	UTC
Synchronization	Rising (leading) edge on-time
Source Impedance	50 Ω nominal
Output Drive	
High Level	10 V ± 1 Vdc into 50 Ω load
Low Level	0 V ± 1 Vdc into 50 Ω load
Rise Time	< 20 nS
Fall Time	< 1 µS
Protection	Short circuit proof

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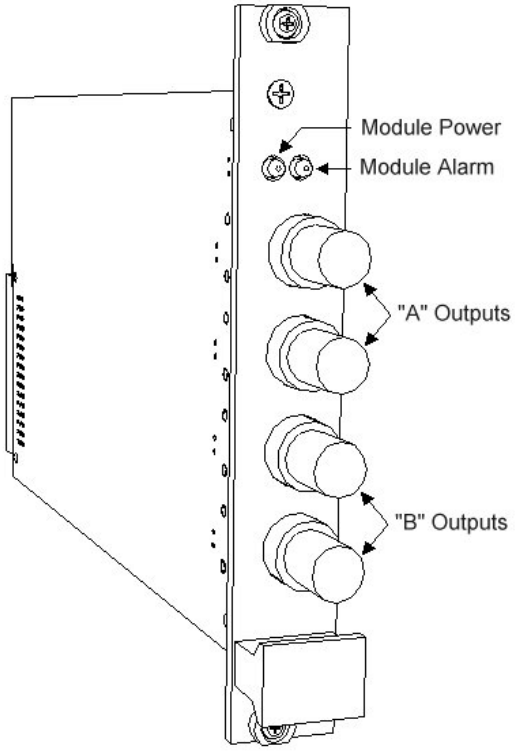
1 MHz TTL Output Module 385-4010-10

The 1 MHz TTL Output Module provides high drive capability 1 MHz outputs. Modules can be installed in any slot from 3 through 15 (slots 1 through 4 in GSync). Each module is “hot swappable”. It can be removed or installed without removing power from the CommSync II System or interrupting operations. (*Note: These modules can be configured to provide 1 PPS (at varying pulse widths), 1 MHz, 5 MHz, or a composite 1 PPS/5 MHz output as configured by dipswitch. Factory setting is 1 MHz*.)

2.1 LED Status Indicators

The module’s LEDs indicate the status of the module.

- The Green LED indicates power to the module.
- The Red LED is the Alarm indicator that illuminates when there is a fault in the 1 PPS reference signal from the online GTF module.



2.2 Output Configurations

The module provides four TTL level signals at a rate of 1 MHz through BNC connectors.

2.3 Status

The status of the 1 MHz TTL Output Module can be obtained from the GTF module SSTA message or viewed from the Front Panel display (Menu 8). The status message consists of an identification number (first byte) in hex format and a bus status message (second byte).

2.3.1 Status Message

ID	Status
0x60	Bit7 = 1 PPS or 10 MHz Input Fault (0=no fault) Bit6 = Output Synchronization Fault (0=no fault) Bits5,4 = Optional Pulse width (for 1 PPS only) (DSW6/7) Bits3,2 = 1 MHz output selected top two outputs (DSW4/3) Bits1,0 = 1 MHz output selected bottom two outputs (DSW2/1)

2.3.2 Status Bits and Configuration Settings

Status bits 0 through 5 reflect the settings of the dipswitches on the module. These settings determine the output. See the tables below for further explanation of these status bits.

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Status Bits 3, 2, 1, 0				
Frequency	Dipswitch Settings			
	B Outputs		A Outputs	
	DSW1	DSW2	DSW3	DSW4
1 PPS	0	0	0	0
1 MHz	0	1	0	1
5 MHz	1	0	1	0
Comp 5MHz	1	1	1	1

Status Bits 5 and 4		
Pulse Width*	Dipswitch Settings	
	DSW6	DSW7
20 mS	0	0
2 mS	0	1
200 μS	1	0
20 μS	1	1

** Note: Pulse width only affects 1 PPS output.*

2.3.3 Front Panel Display (Example)

```
Slot 3  Comp TTL Output Module   0x60 ≡
Status: 0x05 1 MHz Outputs
```

2.3.4 Commands

There are no commands specific to this output module.

2.4 Specifications

The output signals are synchronized to the 1 PPS generated by the online GTF module; therefore, the output signals have the same accuracy and stability as the online GTF module's generated signal connected to the module through the system's passive backplane.

Number of Outputs 4
Connector Type ..... BNC female
Rate ..... 1 MHz
Duty Cycle 50%
Synchronization Reference ..... UTC
Synchronization ..... Rising (leading) edge on-time
Source Impedance ..... 50 Ω nominal
Output Drive
- High Level ..... ≥ +4.0 V into 50 Ω load
- Low Level ..... ≤ +0.2 V into 50 Ω load

Protection ..... Short circuit proof

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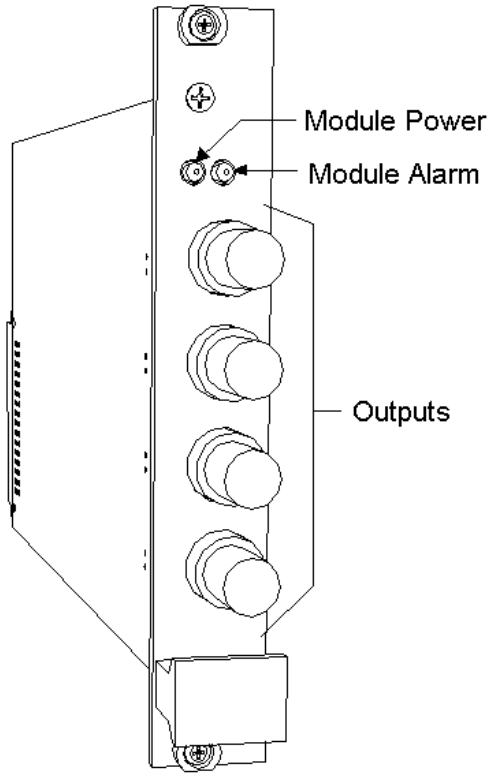
5/10 MHz TTL Output Module 385-4010-03, -04

The TTL Output Module provides 5 MHz and/or 10 MHz TTL level frequency outputs. Modules can be installed in any slot from 3 through 15 (slots 1 through 4 in GSync). Each module is "hot swappable". It can be removed or installed without removing power from the CommSync II System or interrupting operations. Each module contains a VCXO and the necessary logic to minimize the effects of a fault induced switchover.

2.1 LED Status Indicators

The module's LEDs indicate the status of the module.

- The Green LED indicates power to the module.
- The Red LED is the Alarm indicator that illuminates when there is a fault in the reference signal from the online GTF module and/or the module's VCXO.



2.2 Output Configurations

The module provides four TTL level signals at either 5 MHz or 10 MHz. The following matrix indicates which dash number produces which output:

MODULE CONFIGURATION			
Part Number	Freq Out	Output	Connector
385-4010-03	5 MHz	4 x TTL	4 x BNC
385-4010-04	10 MHz	4 x TTL	4 x BNC

2.3 Status

The status of the TTL Output Module can be obtained from the GTF module SSTA message or viewed from the Front Panel display (Menu 8). The status message consists of an identification number (first byte) in hex format and a bus status message (second byte).

2.3.1 Status Message

Dash Number	ID	Status
-03	0x16	Bit6=Frequency Output Fault Bit7=Frequency Input Fault
-04	0x17	

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2.3.2 Front Panel Display (Example)

```
Slot 7  5MHz TTL Output          0x16  ≡
Status: 0xC0 Freq in & out Fault
```

2.3.3 Commands

There are no commands specific to the TTL Output Module.

2.4 Specifications

The output signals are synchronized to the 10 MHz signal generated by the system's online GTF module; therefore, the output signals have the same accuracy and stability as the online GTF module's generated signal connected to the module through the system's passive backplane.

The difference between the versions is the output signal frequency.

Number of Outputs 4
Connector Type ..... BNC female
Frequency .....
  385-4010-03 ..... 5 MHz
  385-4010-04 ..... 10 MHz
Wave Shape ..... Square wave with 50 +/-5% duty cycle
Output Levels into 50 Ω
  High ..... ≥ +2.5 VDC
  Low ..... < 0.5 VDC
Source Impedance ..... 50 Ω nominal
Protection ..... Short circuit proof

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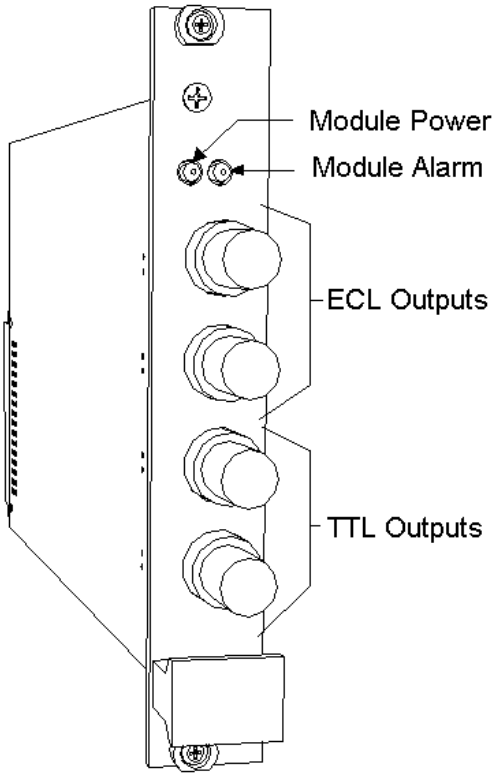
5/10 MHz TTL/ECL Output Module 385-4010-01, -02

The TTL/ECL Output Module provides 5 MHz and/or 10 MHz TTL and ECL level frequency outputs. Modules can be installed in any slot from 3 through 15 (slots 1 through 4 in GSync). Each module is "hot swappable". It can be removed or installed without removing power from the CommSync II System or interrupting operations. Each module contains a VCXO and the necessary logic to minimize the effects of a fault induced switchover.

2.1 LED Status Indicators

The module's LEDs indicate the status of the module.

- The Green LED indicates power to the module.
- The Red LED is the Alarm indicator that illuminates when there is a fault in the reference signal from the online GTF module and/or the module's VCXO.



2.2 Output Configurations

The module provides two TTL and two ECL level signals at either 5 MHz or 10 MHz.

The following matrix indicates which dash number produces what output:

MODULE CONFIGURATION			
Part Number	Freq Out	Output	Connector
385-4010-01	5 MHz	2 x TTL/2 x ECL	4 x BNC
385-4010-02	10 MHz	2 x TTL/2 x ECL	4 x BNC

2.3 Status

The status of the TTL/ECL Output Module can be obtained from the GTF module SSTA message or viewed from the Front Panel display (Menu 8). The status message consists of an identification number (first byte) in hex format and a bus status message (second byte).

2.3.1 Status Message

Dash Number	ID	Status
-01	0x20	Bit6=Frequency Output Fault
-02	0x21	Bit7=Frequency Input Fault

2.3.2 Front Panel Display (Example)

```
Slot 7  5MHz TTL/ECL Output      0x20  ≡
Status: 0x80 Freq in Fault
```

2.3.3 Commands

There are no commands specific to the TTL/ECL Output Module.

2.4 Specifications

The output signals are synchronized to the 10 MHz signal generated by the system's online GTF module; therefore, the output signals have the same accuracy and stability as the online GTF module's generated signal connected to the module through the system's passive backplane.

The difference between the versions is the output signal frequency.

Number of Outputs
- TTL.....2
- ECL.....2

Connector Type .....BNC female

Frequency .....
- 385-4010-01.....5 MHz
- 385-4010-02.....10 MHz

Wave Shape..... Square wave with 50 +/-3% duty cycle

Output Levels into 50 Ω
- TTL High Level..... $\geq$ +2.5 VDC
- TTL Low Level..... <+0.5 VDC
- ECL High Level ..... $\geq$ -1.2 VDC
- ECL Low Level..... < -0.75 VDC

Source Impedance .....50 Ω nominal

Protection .....Short circuit proof

5/10 MHz RS-422 Output Module 385-4009

The RS-422 Output Module provides 5 MHz and/or 10 MHz RS-422 level frequency outputs. Modules can be installed in any slot from 3 through 15 (slots 1 through 4 in GSync). Each module is “hot swappable”. It can be removed or installed without removing power from the CommSync II System or interrupting operations. Each module contains a VCXO and the necessary logic to minimize the effects of a fault induced switchover.

2.1 LED Status Indicators

The module’s LEDs indicate the status of the module.

- The Green LED indicates power to the module.
- The Red LED is the Alarm indicator that illuminates when there is a fault in the reference signal from the online GTF Module and/or the module’s VCXO.

2.2 Output Configurations

The RS-422 Output Module is available in four versions. Each version provides RS-422 output level signals. The following matrix indicates which dash number produces which output, and the type of output connectors used:

MODULE VERSION CONFIGURATION			
Part Number	Freq Out	Output	Connector
385-4009-01	5 MHz	6 x RS-422	2 x DE-9
385-4009-02	10 MHz	6 x RS-422	2 x DE-9
385-4009-03	5 MHz	4 x RS-422	4 x Triax
385-4009-04	10 MHz	4 x RS-422	4 x Triax

2.3 Output Connector Options

D-Subminiature Connectors

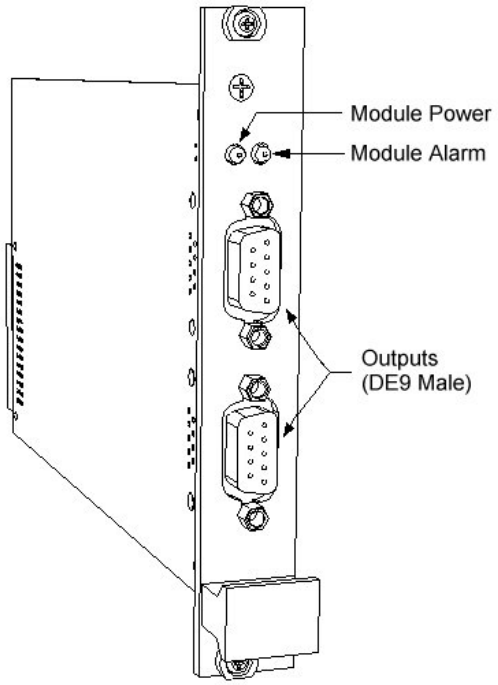
If the module is configured with DE-9 connectors, then the connectors are wired as follows:

- Upper Connector

Outputs	(+)	(-)
#1a	Pin 1	Pin 6
#2a	Pin 7	Pin 8
#3a	Pin 5	Pin 9
Sig Com/Return	Pins 2, 3, 4	

- Lower Connector

Outputs	(+)	(-)
#1b	Pin 1	Pin 6
#2b	Pin 7	Pin 8
#3b	Pin 5	Pin 9
Sig Com/Return	Pins 2, 3, 4	



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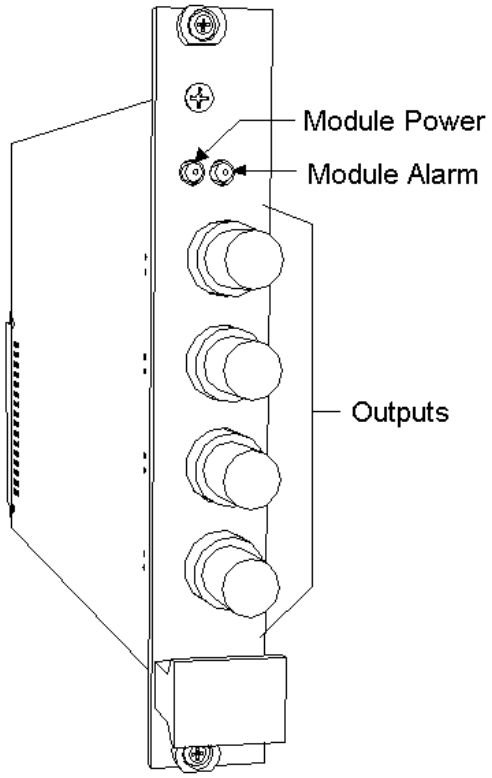
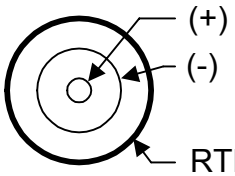
Outputs	(+)	(-)
#1b	Pin 1	Pin 6
#2b	Pin 7	Pin 8
#3b	Pin 5	Pin 9
Sig Com/Return	Pins 2, 3, 4	



Connectors

If the module is configured with 3-Lug Triax output connectors, then the connections are as follows:



Center pin is (+) Signal

Inner ring is (-) Signal

Outer shell is Signal Return

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2.4 Status

The status of the RS-422 Output Module can be obtained from the GTF module SSTA message or viewed from the Front Panel display (Menu 8). The status message consists of an identification number (first byte) in hex format and a bus status message (second byte).

2.4.1 Status Message

Dash Number	ID	Status
-01	0x14	Bit6=Frequency Output Fault Bit7=Frequency Input Fault
-02	0x15	
-03	0x14	
-04	0x15	

2.4.2 Front Panel Display (Example)

```
Slot 6  10MHz RS-422 Output     0x15  ≡
Status: 0x40 Freq out Fault
```

2.4.3 Commands

There are no commands specific to the RS-422 Output Module.

2.5 Specifications

The output signals are synchronized to the 10 MHz signal generated by the system's online GTF Module; therefore, the output signals have the same accuracy and stability as the online GTF Module's generated signal connected to the module through the system's passive backplane.

The difference between the versions is the output connector type and number of output signals, and the output signal frequency.

Number of Outputs
- 385-4009-01 and 385-4009-02 6
- 385-4009-03 and 385-4009-04 4

Connector Type
- 385-4009-01 and 385-4009-02 ..... 9-contact male D-Subminiature
- 385-4009-03 and 385-4009-04 ..... 3-Lug Triax (Trompeter BJ77)
  (Mating plug: Trompeter PL75)

Frequency .....
- 385-4009-01 and 385-4009-03 ..... 5 MHz
- 385-4009-02 and 385-4009-04 ..... 10 MHz

Wave Shape ..... Square wave with 50 +/-5% duty cycle

Output Levels into 120 Ω ..... > 3 Vpp differential
(meets EIA standards RS-422 and RS-485)

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5/10 MHz Fiber Optic Output Module 385-4011

The Fiber Optic Output Module generates optical signals for use by external optical receivers that provide 5 MHz and/or 10 MHz frequency outputs. A version is available that provides a 5 MHz optical output for use with other than the FEI-Zyfer optic receiver.

In the -01 and -02 versions the actual frequency of the generated optical signal is twice the frequency of the connected optical receiver. Doubling the frequency through the fiber allows for a better sine wave signal to be created by the FEI-Zyfer fiber optic receiver (395-1012-01 and 395-1012-02).

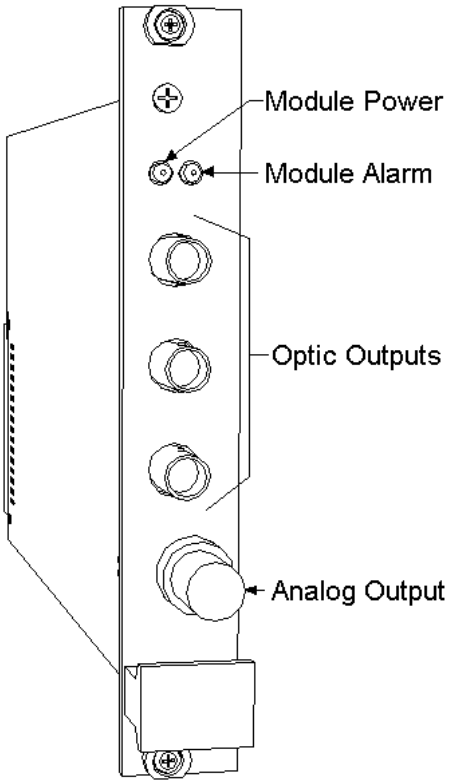
The -03 and -04 versions are available to accommodate those users that require a 5 or 10 MHz output at the fiber.

Modules can be installed in any slot from 3 through 15 (slots 1 through 4 in GSync). Each module is “hot swappable”. It can be removed or installed without removing power from the CommSync II System or interrupting operations. Each module contains a VCXO and the necessary logic to minimize the effects of a fault induced switchover.

2.1 LED Status Indicators

The module’s LEDs indicate the status of the module.

- The Green LED indicates power to the module.
- The Red LED is the Alarm indicator that illuminates when there is a fault in the reference signal from the online GTF module and/or the module’s VCXO.



2.2 Output Configurations

The Fiber Optic Frequency Output Module has three optical signals that, when connected to a FEI-Zyfer Fiber Optic Receiver 395-1012-01 or 395-1012-02, provide either 5 MHz or 10 MHz sine wave output signals. In addition to the optical outputs, an analog frequency output is provided. The following matrix indicates which dash number produces which frequency at the output of the connected fiber optic receiver:

MODULE CONFIGURATION		
Dash Number	Optic Output Frequency	Analog Output
385-4011-01	10 MHz	5 MHz
385-4011-02	20 MHz	10 MHz
385-4011-03	5 MHz	5 MHz
385-4011-04	10 MHz	10 MHz

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2.3 Status

The status of the Fiber Optic Output Module can be obtained from the GTF module SSTA message or viewed from the Front Panel display (Menu 8). The status message consists of an identification number (first byte) in hex format and a bus status message (second byte).

2.3.1 Status Message

Dash Number	ID	Status
-01	0x18	Bit6=Frequency Output Fault Bit7=Frequency Input Fault
-02	0x19	
-03	0x18	
-04	0x19	

2.3.2 Front Panel Display (Example)

```
Slot 8  10MHz Fiber Optic Output 0x19  ≡
Status: 0x00 No Faults
```

2.3.3 Commands

There are no commands specific to this output module.

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2.4 Specifications

The output signals are synchronized to the 10 MHz signal generated by the system's online GTF module; therefore, the output signals have the same accuracy and stability as the online GTF module's generated signal connected to the module through the system's passive backplane.

The difference between the versions is the output signal frequency. Each module has three optical outputs and one analog output.

Fiber Optic Output

- Number of Outputs 3
- Connector Type ..... ST
- Frequency
  - 385-4011-01, 385-4011-04 ..... 10 MHz
  - 385-4011-02 ..... 20 MHz
  - 385-4011-03 ..... 5 MHz
- Wavelength ..... 850 nm
- Power ..... > -14 dBm
- Fiber Cable ..... Multimode 62.5/125
- Maximum Cable length ..... 1 km (when used with FEI-Zyfer F/O receivers)

Analog Output

- Number of Outputs 1
- Connector Type ..... BNC female
- Frequency
  - 385-4011-01, 385-4011-03 ..... 5 MHz
  - 385-4011-02, 385-4011-04 ..... 10 MHz
- Wave Shape ..... Sinusoid
- Harmonics ..... < -50 dBc
- Spurious Noise ..... <- 60 dBc
- Amplitude into 50 Ω ..... 13 +4, -1 dBm
- Coupling ..... DC
- Source Impedance ..... 50 Ω nominal
- Protection ..... Short circuit proof

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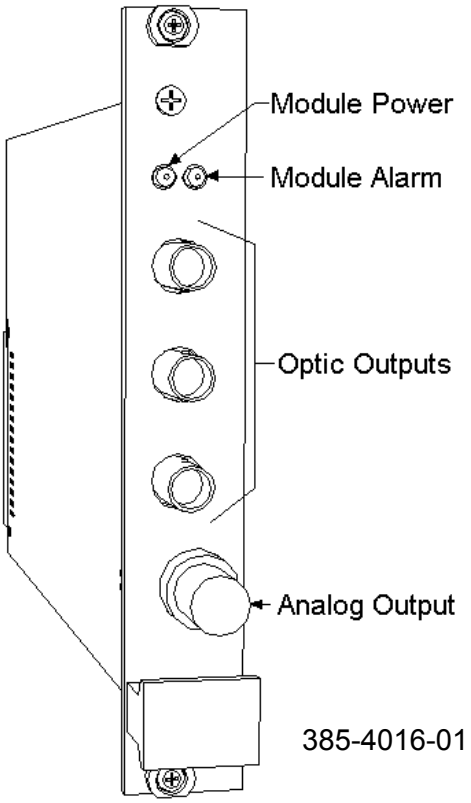
Clock Rate Output Modules

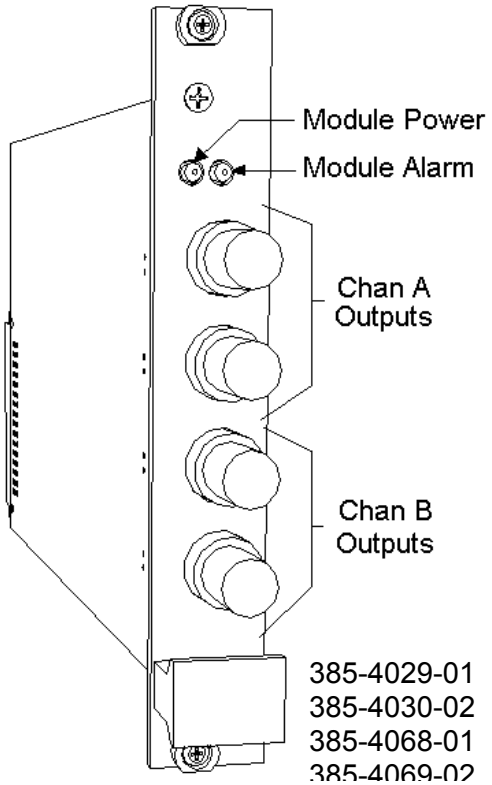
The Clock Rate Output Modules include the 385-4016, 385-4029, 385-4030, 385-4068, and 385-4069 modules. These modules generate signals from 8 kHz to 2048 kHz or 8 kHz to 8192 kHz (See Clock Rate Module Configuration Matrix.) in fiber optic, TTL, or RS-422 formats. They can be installed in any slot from 3 through 15 (slots 1 through 4 in GSync). Each module is "hot swappable". It can be removed or installed without removing power from the CommSync II System or interrupting operations. Each module contains a VCXO and the necessary logic to minimize the effects of a fault induced switchover.

2.1 LED Status Indicators

The module's LEDs indicate the status of the module.

- The Green LED indicates power to the module.
- The Red LED is the Alarm indicator that illuminates when there is a fault in the reference frequency from the online GTF module and/or when the module's DDS has a fault.





2.2 Output Configurations

There are multiple configurations available for the Clock Rate Output Modules. The Clock Rate Fiber Optic Output Module (385-4016-01) has three optical signals that, when connected to a FEI-Zyfer Fiber Optic Receiver 395-1010-01 provide RS-422 level output signals, and when connected to Fiber Optic Receiver 395-1011-01 provide TTL level output signals. In addition to the optical outputs, the module also has an analog frequency output. It has a frequency range of 8 kHz to 2048 kHz in 8 kHz increments.

The Dual Clock Rate TTL Output Module provides four TTL level signals through four BNC connectors. The two upper connectors are dedicated to one channel, and the

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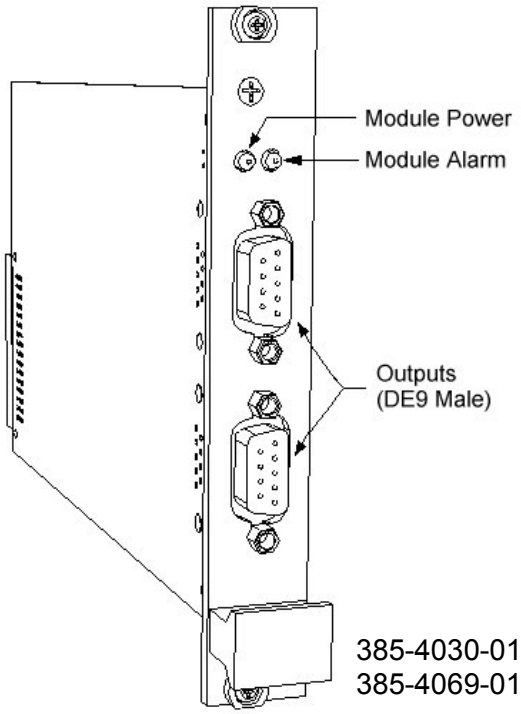
bottom two connectors are dedicated to a second channel. The frequency range is 8 kHz to 2048 kHz in 8 kHz increments.

The Dual Clock Rate RS-422 Output Module (385-4030) is available in two versions. Each version provides RS-422 output level signals. The -01 version provides three RS-422 outputs via one DE-9 connector from Register 1 and three RS-422 outputs via one DE-9 connector from Register 2. These outputs may be from 8 kHz to 2048 kHz in 8 kHz increments. The -02 version provides two RS-422 outputs via two Triax connectors from Register 1 and two RS-422 outputs through two Triax connectors from Register 2.The frequency range is 8 kHz to 2048 kHz in 8 kHz increments.

In addition, two Dual Output N.8 Clock Rate Modules are available. These modules have a frequency range of 8 kHz to 8192 kHz in 8 kHz increments. There is a TTL version (385-4068-01) and an RS-422 version (385-4069-01) of this type of module.



385-4030-01
385-4069-01

See Matrix for comparison of configurations.

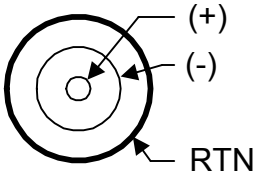
Clock Rate Module Configuration Matrix				
Part Number	Output Format	Connectors	# of Outputs	Frequency Range
385-4016-01	Fiber Optic	3 ST + 1 BNC	3 + BNC	8 kHz to 2048 kHz
385-4029-01	TTL	4 BNC	2 + 2	8 kHz to 2048 kHz
385-4030-01	RS-422	2 DE-9	3 + 3	8 kHz to 2048 kHz
385-4030-02	RS-422	4 Triax	2 + 2	8 kHz to 2048 kHz
385-4068-01	TTL	4 BNC	2 + 2	8 kHz to 8192 kHz
385-4069-01	RS-422	2 DE-9	3 + 3	8 kHz to 8192 kHz
385-4069-02	RS-422	4 Triax	2 + 2	8 kHz to 8192 kHz

2.3 Output Connectors

Modules configured with DE-9 connectors are wired the as follows:

Outputs	(+)	(-)
Output 1	Pin 1	Pin 6
Output 2	Pin 8	Pin 7
Output 3	Pin 5	Pin 9
Sig Com/Return	Pins 2, 3, 4	

Modules configured with 3-Lug Triax output connectors are wired as follows:



The center pin is (+)
The outer signal is (-)
The outer shell is Signal Return.

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2.4 Rate Selection

The clock rate can be selected through the front panel keypad and menu or commands from the I/O port.

2.4.1 Front Panel

When entering the rate through the keypad/display, the decimal frequency multiplier is shown in the lower right hand corner of the LCD screen, where 1 = 8 kHz and 256 = 2048 kHz. The clock rate is determined by product of the multiplier value (N) and 8 kHz (clock rate = N x 8 kHz). (Actual menus may vary.)

To modify the output rate(s) through the keypad/display:

- Press key 8 to enter the *Output Module Menu*.
- Press EDIT while the screen is cycling through the various output modules.
- Use the arrow keys to select the Clock Rate module to be modified.

```
Slot 8 Clock Rate Fiber Optic    0x32 ≡
Set @  800 kHz [ 100 x 8 kHz]
```

- Press the EDIT key to edit the clock rate for the selected module.
- Use the number keys and enter multiplier (M) to select a new clock rate. (Frequency = N x 8 kHz)

```
Slot 8 Clock Rate Fiber Optic    0x32 ≡
Set @ 1600 kHz [ 200 x 8 kHz]
```

- Press the ENTER key and then MENU key to complete the clock rate change and continue to cycle through the output module status screens, or:
- Press the MENU key to exit the edit mode without invoking the selected clock rate and continue to cycle through the output module status screens, or:
- Press the ENTER key to complete the clock rate change, and then:
- Use the arrow keys to select the next module's status screen.

To exit the Menu 8 function:

- Press any active Menu number key, such as key 1.

If the module is a dual output type, the menu will have an "a" next to the Slot number for Register 1 and a "b" next to the Slot number for Register 2.

```
Slot 8a Dual Clock Rate TTL Out  0x34 ≡
Set @  800 kHz [ 100 x 8 kHz]
```

Each register is individually set via these "a" and "b" selections.

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2.4.2 Commands

The $CLKR command can be used to select/change the clock rate output. For instance, the command $CLKR,8,1,200* will set the Clock Rate Output Module in slot 8 to 1600 kHz (8 x 200). For dual output modules, Register 2 is commanded separately. Thus, the command $CLKR,8,2,192* will set the second register of a dual clock rate module in slot 8 to 1536 kHz (8 x 192). See the protocol document 385-8002 for further information.

2.5 Status

The status of the Clock Rate Output Modules can be obtained from the GTF module SSTA message or viewed from the Front Panel display (Menu 8). The status message consists of an identification number (first byte) in hex format and a bus status message (second byte).

2.5.1 Status Message

Part Number	ID	Status
385-4016	0x32	Fault bit is in ID. If ID is 3A = Module Fault Status Byte = Rate Multiplier (hex)
385-4029	0x34	Fault bit is in ID. For instance, if ID is 3C, it is a 385-4029 module with a fault. Status Byte = Rate Multiplier (hex) (Chan A Rate Multiplier Only. Use $CLKR* command to get both rate multipliers.)
385-4030	0x35	
385-4068	0x36	Bit 7: Fault bit, where 1 = fault Bit 6: Not used (0) Bits 3 through 5: MSB of Register 1 Bits 0 through 2: MSB of Register 2 (Use $CLKR* command to get both rate multipliers.)
385-4069	0x37	

2.5.2 Front Panel Display (Example)

```
Slot 11 Dual N.8 Clock Rate TTL  0x36 ≡
Set @ 8000 kHz [1000 x 8 kHz]
```

2.6 Specifications

The output signals are synchronized to the 10 MHz signal generated by the system's online GTF module; therefore, the output signals have the same accuracy and stability as the online GTF module's 10 MHz generated signal connected to the module through the system's passive backplane.

Unless otherwise stated, the following specifications apply when the system is operating in the Known Position mode, the antenna's geodetic position is known within 25 meters, the antenna is in a fixed location, and the internal oscillator has been disciplined for at least 2 days.

2.6.1 Clock Rate Fiber Optic Output Module (385-4016-01)

The module has three fiber optic outputs and one TTL output.

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Fiber Optic Outputs

Number of Outputs 3
Connector Type ..... ST
Rate ..... Same as Digital output
Accuracy ..... Same as Digital output
Wavelength ..... 850 nm
Power ..... > -14 dBm
Fiber Cable ..... Multimode 62.5/125
Maximum Cable Length ..... 1 km (when used with FEI-Zyfer F/O receiver)

Digital Output

Number of Outputs 1
Connector Type ..... BNC female
Rate ..... 8 kHz to 2048 kHz selected in 8 kHz steps
Wave Shape ..... Square wave with 50 +/-3% duty cycle
Output Levels into 50 Ω
  High ..... ≥ +2.5 VDC
  Low ..... < 0.5 VDC
Source Impedance ..... 50 Ω nominal
Protection ..... Short circuit proof
Jitter ..... < 20 ns at 8 kHz
< 5 ns at > 16 kHz

2.6.2 Dual Clock Rate TTL Output Module (385-4029-01)

Number of Channels 2
Number of Outputs ..... 2 per channel
Connector Type ..... BNC female
Rate ..... 8 kHz to 2048 kHz selected in 8 kHz steps
Wave Shape ..... Square wave with 50 +/-3% duty cycle
Jitter ..... < 20 ns at 8 kHz
< 5 ns at > 16 kHz
Output Levels into 50 Ω
  High ..... ≥ +2.5 VDC
  Low ..... < 0.5 VDC
Source Impedance ..... 50 Ω nominal
Protection ..... Short circuit proof

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2.6.3 Dual Clock Rate RS-422 Output Module (385-4030-01/-02)

There are two versions of this module. The -01 provides outputs via DE-9 connectors, and the second via Triax connectors.

Number of Outputs
- 385-4030-01 ..... 6 (3 of each channel/connector)
- 385-4030-02 ..... 4 (2 of each channel/2 connectors)

Connector Type
- 385-4030-01 ..... 9-contact male D-Subminiature
- 385-4030-02 ..... 3-Lug Triax (Trompeter BJ77)
  (Mating plug: Trompeter PL75)

Rate ..... 8 kHz to 2048 kHz
selected in 8 kHz steps
Wave Shape ..... Square wave with 50 +/-3% duty cycle
Jitter ..... < 20 ns at 8 kHz
< 5 ns at > 16 kHz
Output Levels into 120 Ω ..... > 3 Vpp differential
(meets EIA standards RS-422 and RS-485)

2.6.4 Dual N.8 Clock Rate TTL Output Module (385-4068-01)

Number of Channels 2
Number of Outputs ..... 2 per channel
Connector Type ..... BNC female
Rate ..... 8 kHz to 8192 kHz
selected in 8 kHz steps
Wave Shape ..... Square wave with 50 +/-3% duty cycle
Jitter ..... < 20 ns at 8 kHz
< 5 ns at > 16 kHz

Output Levels into 50 Ω
- High ..... ≥ +2.5 VDC
- Low ..... < 0.5 VDC

Source Impedance ..... 50 Ω nominal
Protection ..... Short circuit proof

2.6.5 Dual N.8 Clock Rate RS-422 Output Module (385-4069-01)

Number of Outputs ..... 6 (3 of each channel/connector)
Connector Type ..... 9-contact male D-Subminiature
Rate ..... 8 kHz to 8192 kHz
selected in 8 kHz steps
Wave Shape ..... Square wave with 50 +/-3% duty cycle
Jitter ..... < 20 ns at 8 kHz
< 5 ns at > 16 kHz
Output Levels into 120 Ω ..... > 3 Vpp differential
(meets EIA standards RS-422 and RS-485)

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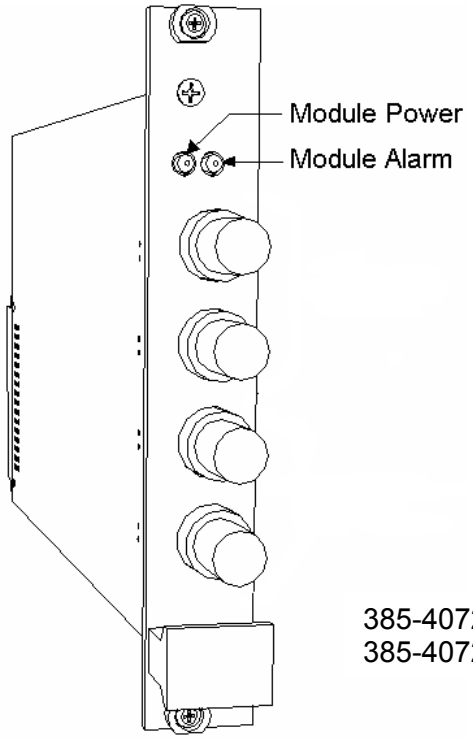
N.1 Clock Rate Output Modules

The N.1 Clock Rate Output Modules generate signals from 1 kHz to 54 MHz in TTL or RS-422 formats. They can be installed in any slot from 3 through 15 (slots 1 through 4 in GSync). Each module is “hot swappable”. It can be removed or installed without removing power from the CommSync II System or interrupting operations.

2.1 LED Status Indicators

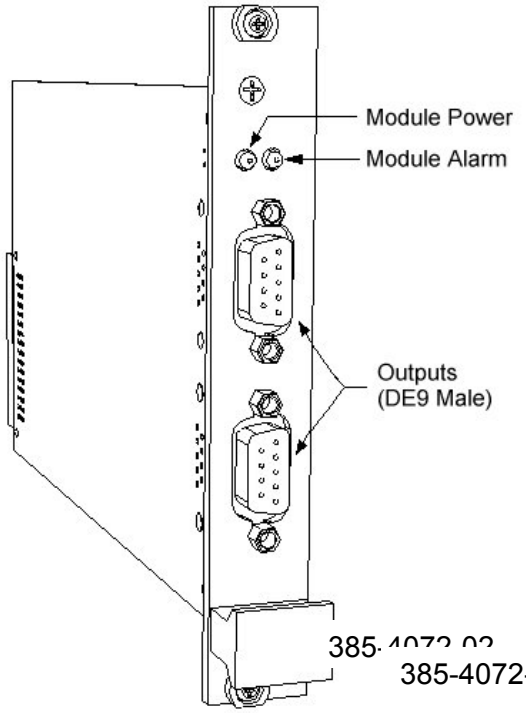
The module’s LEDs indicate the status of the module.

- The Green LED indicates power to the module.
- The Red LED is the Alarm indicator that illuminates when there is a fault in the reference frequency from the online GTF module and/or when the module’s DDS has a fault.



385-4072-01
385-4072-04

2.2 Output Configurations



385-4072-02

There are multiple configurations available for the Clock Rate Output Modules. The N.1 4 Channel Clock Rate Output Module provides either 4 TTL level signals via 4 BNC connectors (385-4072-01) or 4 RS-422 level signals via 4 Triax connectors (385-4072-04). Each channel frequency is independently programmable with a range of 1 kHz to 54 MHz in 10 Hz increments.

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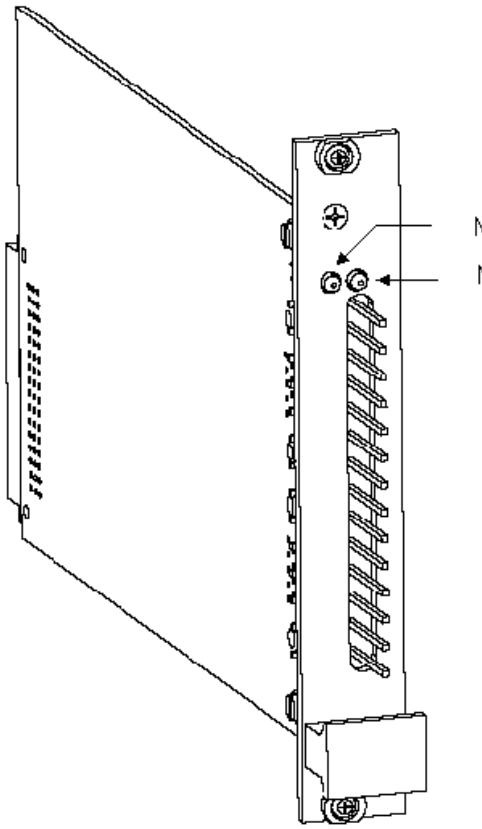
The N.1 6 Channel Clock Rate Output Module provides 6 RS-422 level signals either through 2 DE9 connectors (385-4072-02) or a 14 pin wire wrap connector (385-4072-03). Each channel frequency is independently programmable with a range of 1 kHz to 54 MHz in 10 Hz increments.

See Matrix for comparison of configurations.



385-4072-03

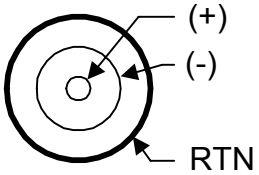
N.1 Clock Rate Output Module Configuration Matrix			
Part Number	Output Format	Connectors	Frequency Range
385-4072-01	TTL	4 BNC	1 kHz to 54 MHz
385-4072-02	RS-422	2 DE-9	1 kHz to 54 MHz
385-4072-03	RS-422	Wire Wrap	1 kHz to 54 MHz
385-4072-04	RS-422	4 Triax	1 kHz to 54 MHz

2.3 Output Connectors

Modules configured with DE-9 connectors are wired the as follows:

Outputs	(+)	(-)
Output 1	Pin 1	Pin 6
Output 2	Pin 8	Pin 7
Output 3	Pin 5	Pin 9
Sig Com/Return	Pins 2, 3, 4	

Modules configured with 3-Lug Triax output connectors are wired as follows:



The center pin is (+)
The outer signal is (-)
The outer shell is Signal Return.

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Modules configured with Wire Wrap connectors are wired the as follows:

Outputs	(+)	(-)
Output 1	Pin 2	Pin 1
Output 2	Pin 4	Pin 3
Output 3	Pin 6	Pin 5
Output 4	Pin 9	Pin 8
Output 5	Pin 11	Pin 10
Output 6	Pin 13	Pin 12
Sig Com/Return	Pins 7 & 14	

2.4 Rate Selection

The clock rate can be selected through the front panel keypad and menu or commands from the I/O port.

2.4.1 Front Panel

To modify the output rate(s) through the keypad/display:

- Press key 8 to enter the *Output Module Menu*.
- Press EDIT while the screen is cycling through the various output modules.
- Use the arrow keys to select the Clock Rate module to be modified.

```
Slot 6a N.1 Clock Rate 6 Channel  0x67
Set @ 00008000 Hz
```

- Press the EDIT key to edit the clock rate for the selected module.
- The menu will have an “a” next to the Slot number for channel 1, a “b” for channel 2, a “c” for channel 3, a “d” for channel 4, a “e” for channel 5 and an “e” for channel 6.
- Use the arrow keys to select the channel to be modified.
- Press the EDIT key to edit the channel.
- Use the number keys and enter a new clock rate frequency.

```
Slot 6a N.1 Clock Rate 6 Channel  0x67
Set @ 01500000 Hz
```

- Press the ENTER key and then MENU key to complete the clock rate change and continue to cycle through the output module status screens, or:

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- Press the MENU key to exit the edit mode without invoking the selected clock rate and continue to cycle through the output module status screens, or:
- Press the ENTER key to complete the clock rate change, and then:
- Use the arrow keys to select the next module's status screen.

To exit the Menu 8 function:

- Press any active Menu number key, such as key 1.

2.4.2 Commands

The $CLKN command can be used to select/change the clock rate output. For instance, the command $CLKN,8,1,8000* will set the N.1 Clock Rate Output Module in slot 8, channel 1, to 8000 Hz. See the protocol document 385-8002 for further information.

2.5 Status

The status of the Clock Rate Output Modules can be obtained from the GTF module SSTA message or viewed from the Front Panel display (Menu 8). The status message consists of an identification number (first byte) in hex format and a bus status message (second byte).

2.5.1 Status Message

Part Number	ID	Status
385-4072-01	0x66	Bit 7: Fault bit, where 1 = fault Bit 6-0: Not used (0)
385-4072-02	0x67	
385-4072-03	0x67	
385-4072-04	0x68	

2.5.2 Front Panel Display (Example)

```
Slot 6a N.1 Clock Rate 6 Channel   0x67
Set @ 54000000 Hz
```

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2.6 Specifications

The output signals are synchronized to the 10 MHz signal generated by the system's online GTF module; therefore, the output signals have the same accuracy and stability as the online GTF module's 10 MHz generated signal connected to the module through the system's passive backplane.

Unless otherwise stated, the following specifications apply when the system is operating in the Known Position mode, the antenna's geodetic position is known within 25 meters, the antenna is in a fixed location, and the internal oscillator has been disciplined for at least 2 days.

2.6.1 N.1 4 Channel Clock Rate TTL Output Module (385-4072-01)

Number of Channels 4
Number of Outputs ..... 1 per channel
Connector Type ..... BNC female
Rate ..... 1 kHz to 54 MHz
selected in 10 Hz steps
Wave Shape ..... Square wave
Duty Cycle ..... 50 +/-5% at < 20 MHz
50 +/-10% at ≥ 20 MHz

Jitter ..... < 10 ns at ≥ 1 MHz
< 20 ns at ≥ 8 kHz and < 1 MHz
< 400 ns at ≥ 1 kHz and < 8 kHz

Output Levels into 50 Ω
High ..... ≥ *+2.5 VDC*
Low ..... < 0.5 VDC
Source Impedance ..... 50 Ω nominal
Protection ..... Short circuit proof

2.6.2 N.1 4 Channel Clock Rate TTL RS-422 Output Module (385-4072-04)

Number of Channels 4
Connector Type ..... 3-Lug Triax (Trompeter BJ77)
(Mating plug: Trompeter PL75)
Rate ..... 1 kHz to 54 MHz
selected in 10 Hz steps
Wave Shape ..... Square wave
Duty Cycle ..... 50 +/-5% at < 20 MHz
50 +/-10% at ≥ 20 MHz

Jitter ..... < 10 ns at ≥ 1 MHz
< 20 ns at ≥ 8 kHz and < 1 MHz
< 400 ns at ≥ 1 kHz and < 8 kHz
Output Levels into 120 Ω ..... > 3 Vpp differential
(meets EIA standards RS-422 and RS-485)

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2.6.3 N.1 6 Channel Clock Rate RS-422 Output Module (385-4072-02, -03)

There are two versions of this module. The -02 provides outputs via DE-9 connectors, and the -03 outputs via Wire Wrap pins.

Number of Channels 6
385-4072-02 ..... 3 from each DE-9 connector
385-4072-03 ..... 6 from wire wrap connector
Rate ..... 1 kHz to 54 MHz
selected in 10 Hz steps
Wave Shape ..... Square wave
Duty Cycle ..... 50 +/-5% at < 20 MHz
50 +/-10% at ≥ 20 MHz

Jitter ..... < 10 ns at ≥ 1 MHz
< 20 ns at ≥ 8 kHz and < 1 MHz
< 400 ns at ≥ 1 kHz and < 8 kHz
Output Levels into 120 Ω ..... > 3 Vpp differential
(meets EIA standards RS-422 and RS-485)

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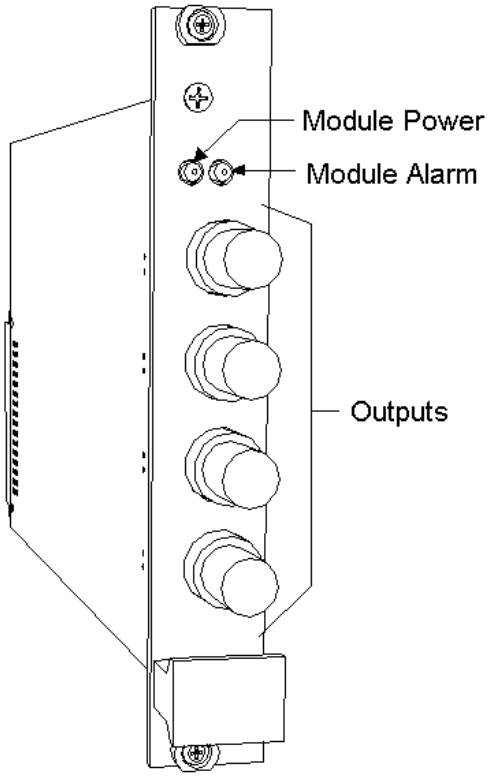
Frequency Synthesizer Module 385-4039

The Frequency Synthesizer Output Module provides four 200 Hz to 30 MHz sine wave frequency outputs. Modules can be installed in any slot from 3 through 15 (slots 1 through 4 in GSync). Each module is “hot swappable”. It can be removed or installed without removing power from the CommSync II System or interrupting operations. Each module contains a phase-locked (to the reference 10 MHz) Frequency Synthesizer, and the necessary logic to minimize the effects of a fault induced switchover. The output frequency resolution is 1/100 th of 1 Hz.

2.1 LED Status Indicators

The module’s LEDs indicate the status of the module.

- The Green LED indicates the module uP is running, and power is applied to the module.
- The Red LED is the Alarm indicator that illuminates when there is a fault in the reference input signal from the online GTF module and/or the module’s synthesizer.



2.2 Output Configurations

The module provides four 50 Ω sine wave output signals at a frequency of 200 Hz to 29.9999 MHz in 0.01Hz increments.

2.3 Status

The status of the Frequency Synthesizer Output Module can be obtained from the GTF module SSTA message or viewed from the Front Panel display (Menu 8). The status message consists of an identification number (first byte) in hex format and a bus status message (second byte).

2.3.1 Status Message

Dash Number	ID	Status
-01	0x29	Bit0= last cmd sent, where: 0=freq set cmd 1=freq read cmd Bit4=Frequency mismatch fault Bit5=Frequency lock fault Bit6=POM communication fault Bit7=Frequency input fault
-02	0x28	
-07	0x29	
-08	0x29	
-09	0x29	

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2.3.2 Front Panel Display (Example)

```
Slot 3  Freq-Synth Sine Output      0x29 ≡
Status: 0x01  Freq  6.523333340000 MHz
```

2.4 Frequency Selection

The output frequency of the Frequency Synthesizer Module can be set by the front panel or via command.

2.4.1 Front Panel

To modify the output rate(s) through the keypad/display:

- Press key 8 to enter the *Output Module Menu*.
- Press EDIT while the screen is cycling through the various output modules.
- Use the arrow keys to select the Frequency Synthesizer module to be modified.

```
Slot 3  Freq-Synth Sine Output      0x29 ≡
Status: 0x01  Freq  6.523333340000 MHz
```

- Press the EDIT key to edit the frequency for the selected module.
- Use the number keys and enter frequency (in MHz)

```
Slot 3  Freq-Synth Sine Output      0x29 ≡
Status: 0x01  Freq  7.523333340000 MHz
```

- Press the ENTER key and then MENU key to complete the frequency change and continue to cycle through the output module status screens, or:
- Press the MENU key to exit the edit mode without invoking the selected frequency and continue to cycle through the output module status screens, or:
- Press the ENTER key to complete the frequency change, and then:
- Use the arrow keys to select the next module's status screen.

2.4.2 Commands

The FREQ command can be used to select/change the frequency output. For instance, the command, $FREQ,3,3.312000*, will set a Frequency Synthesizer Module in slot 3 to a frequency of 3.312 MHz. See the protocol document 385-8002 for further information.

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2.5 Specifications

The output signals are synchronized to the 10 MHz signal generated by the system's online GTF module; therefore, the output signals have the same accuracy and stability as the online GTF module's generated signal connected to the module through the system's passive backplane.

Number of Outputs 4
Connector Type ..... BNC female

2.5.1 Sine Wave Output Modules

Frequency Range
- 385-4039-01 ..... 6 MHz to 8 MHz* in 0.01 Hz increments
- 385-4039-07 ..... 200 Hz to 15 MHz in 0.01 Hz increments
- 385-4039-08 ..... 15 MHz to 20 MHz in 0.01 Hz increments
- 385-4039-09 ..... 20 MHz to 29.999 MHz in 0.01 Hz increments

Wave Shape ..... Sinusoid
Amplitude into 50 Ω
- 385-4039-07, -08 ..... 13 +2, -1 dBm
- 385-4039-09 ..... 10.5 +2, -1 dBm

Harmonics ..... < -50 dBc
Spurious Noise ..... <- 60 dBc
Coupling ..... AC
Source Impedance ..... 50 Ω nominal
Protection ..... Short circuit proof
* 385-4039-01 has been replaced by 385-4039-07

2.5.2 TTL Output Module (-02)

Rate ..... 200 Hz to 29.9999 MHz in 0.01 Hz increments
Duty Cycle ..... 50%+/-5%
Synchronization Reference ..... UTC
Synchronization ..... Rising (leading) edge on-time
Source Impedance ..... 50 Ω nominal
Output Drive
- High Level ..... ≥ +4.0 V into 50 Ω load
- Low Level ..... ≤ +0.2 V into 50 Ω load

Protection ..... Short circuit proof

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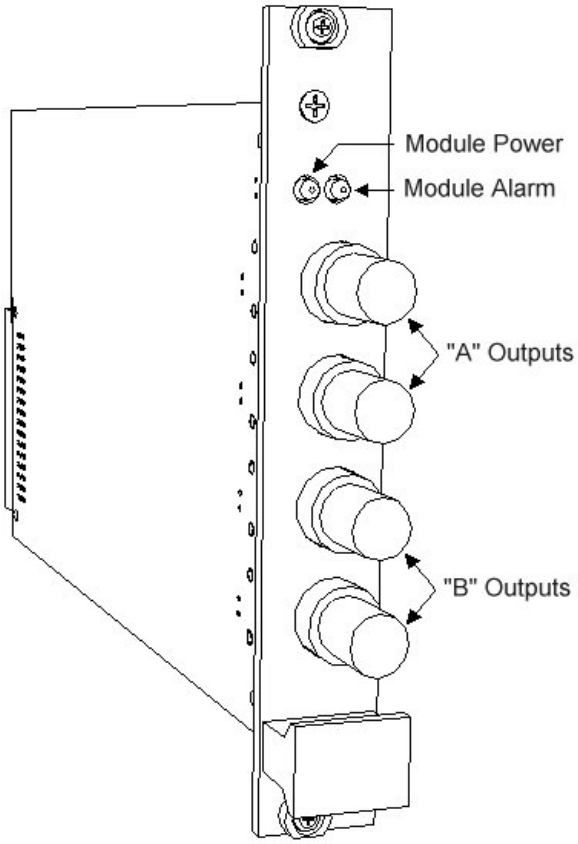
Composite Output Module 385-4033-01

The Composite Output Module provides two outputs of two independent pulse rates. Modules can be installed in any slot from 3 through 15 (slots 1 through 4 in GSync). Each module is “hot swappable”. It can be removed or installed without removing power from the CommSync II System or interrupting operations.

2.1 LED Status Indicators

The module’s LEDs indicate the status of the module.

- The Green LED indicates power to the module.
- The Red LED is the Alarm indicator that illuminates when there is a fault in the reference signal from the online GTF module.



2.2 Output Configuration

The module provides four TTL level outputs at rates selected by the dipswitch settings (see table below). Outputs are BNC connectors. The top two BNC outputs (“A” Outputs) and the bottom two BNC outputs (“B” Outputs) may be independently set for a selected rate.

2.3 Rate Selection

The table below shows the dipswitch settings for selecting the output. (See Figure 3 for switch locations.)

RATE SELECTION							
Selected Rate	Pulse Width	Dipswitch Settings					
		B Outputs		A Outputs		1PPS Pulse width	
		1	2	3	4	5	6
1 PPS	20 mS	On	On	On	On	On	On
1 PPS	2 mS	On	On	On	On	Off	On
1 PPS	200 μS	On	On	On	On	On	Off
1 PPS	20 μS	On	On	On	On	Off	Off
1 MHz	50%	Off	On	Off	On	X	X
5 MHz	50%	On	Off	On	Off	X	X
Composite*	See Figure 4	Off	Off	Off	Off	X	X

Dipswitch 7, and 8 are not used, and should be set to On/On and have no effect.

*See Figure 4 for composite waveform description.

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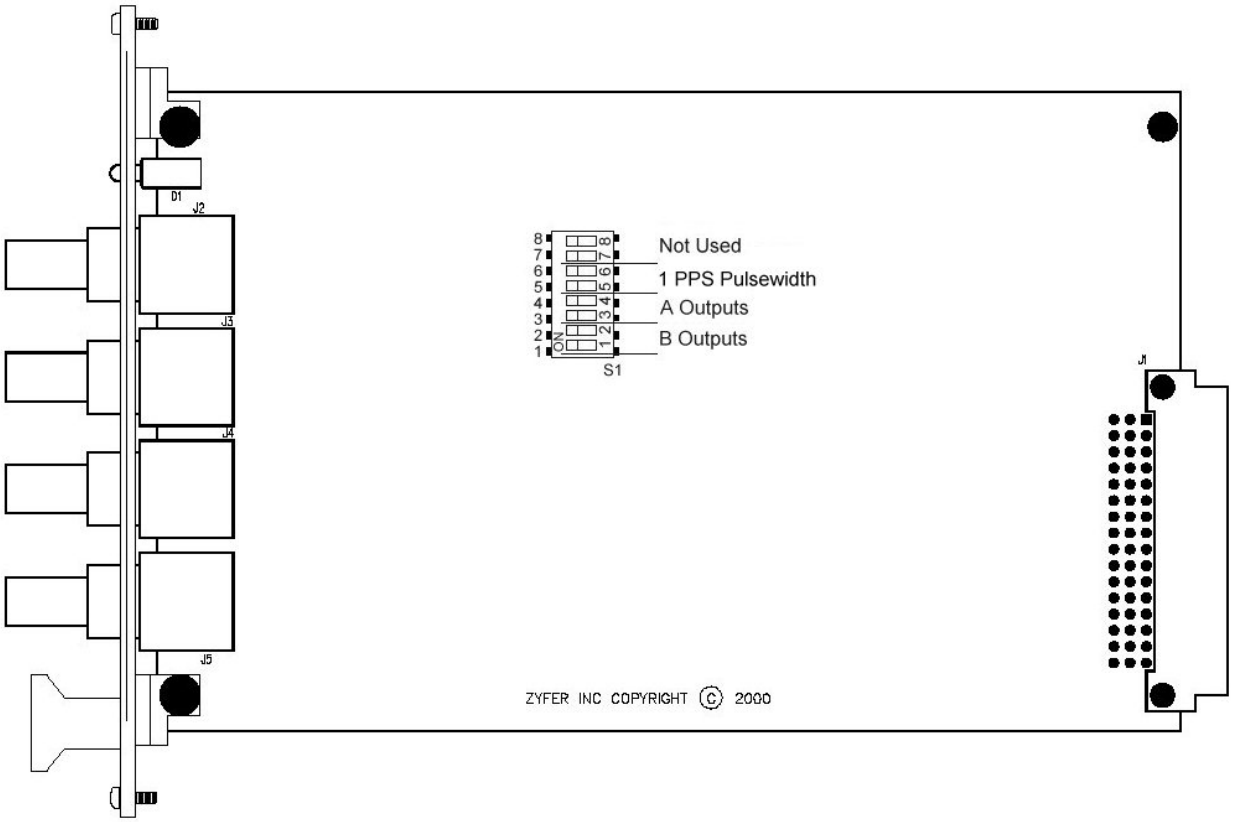

Figure 3 Composite Output Module Switch Location

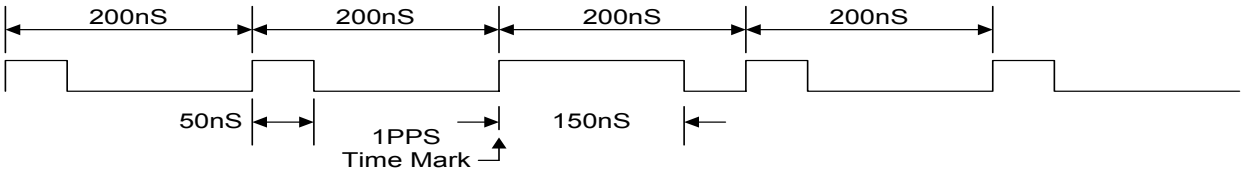

Figure 4 Composite Waveform

2.4 Status

The status of the Composite Output Module can be obtained from the GTF module SSTA message or viewed from the Front Panel display (Menu 8). The status message consists of an identification number (first byte) in hex format and a bus status message (second byte).

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2.4.1 Status Message

ID	Status
0x61	Bit 7 = 1PPS or 10 MHz Input Fault (0=no fault) Bit 6 = Output Synchronization Fault (0=no fault) Bits 5,4 = Selected 1PPS Pulse rate (DSW 6,5) Bits 3,2 = Selected output rate for top two outputs (DSW 4,3) Bits1,0 = Selected output rate for bottom two outputs (DSW 2,1)

2.4.2 Front Panel Display (Example)

```
Slot 3  Comp TTL Output Module   0x60 ≡
Status: 0x31
```

In this example, a status of 0x31 indicates that the A Outputs are set for 1 PPS, with a pulse width of 20 μS, the B Outputs are set for 1 MHz, and there are no faults.

2.4.3 Commands

There are no commands specific to this output module.

2.5 Specifications

The pulse output signals are synchronized to the 1 PPS and phase-coherent to the 10 MHz reference signals generated by the online GTF module; therefore, the output signals have the same accuracy and stability as the online GTF module's generated signal connected to the module through the system's passive backplane.

Number of Outputs 4
Connector Type ..... BNC female
Rate ..... User Selected
Synchronization Reference ..... UTC
Synchronization ..... Rising (leading) edge on-time
Source Impedance ..... 50 Ω nominal
Output Drive
- High Level ..... ≥ +4.0 V into 50 Ω load
- Low Level ..... ≤ +0.2 V into 50 Ω load

Protection ..... Short circuit proof

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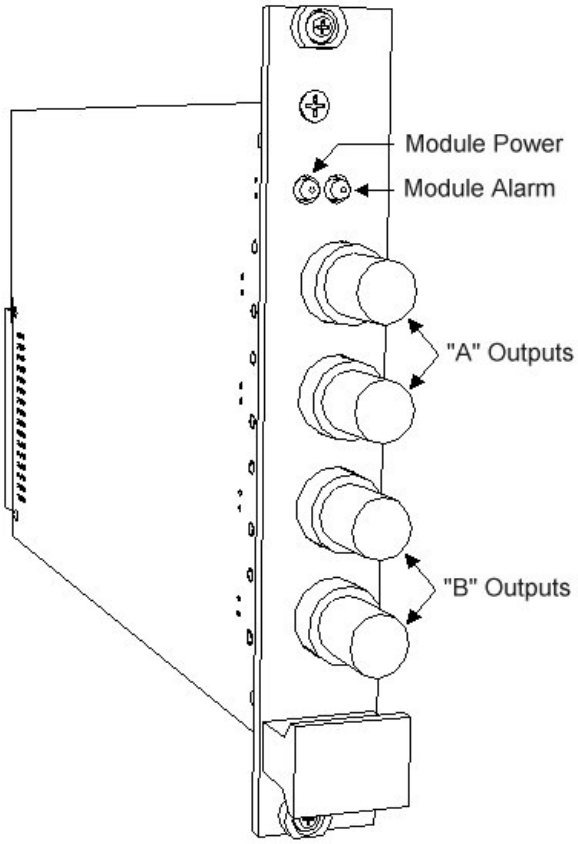
Pulse Rate Output Module 385-4033-02

The Pulse Rate Output Module provides two outputs of two independent pulse rates. Modules can be installed in any slot from 3 through 15 (slots 1 through 4 in GSync). Each module is “hot swappable”. It can be removed or installed without removing power from the CommSync II System or interrupting operations.

2.1 LED Status Indicators

The module’s LEDs indicate the status of the module.

- The Green LED indicates power to the module.
- The Red LED is the Alarm indicator that illuminates when there is a fault in the reference signal from the online GTF module.



2.2 Output Configuration

The module provides four TTL level outputs at a rate selected by the dipswitch settings (see table below). Outputs are through BNC connectors. The top two BNC outputs (“A” Outputs) and the bottom two BNC outputs (“B” Outputs) may be independently set for a selected rate.

2.3 Rate Selection

The table below shows the settings for selecting pulse rates for the two outputs. (For the dipswitch settings, 0 = on and 1 = off.) (See Figure 5 for location of the dipswitch.)

RATE SELECTION							
		Dipswitch Settings					
Selected Rate	Pulse Width	B Outputs			A Outputs		
		1	2	3	4	5	6
1 PPS	100 mS	On	On	On	On	On	On
10 PPS	10 mS	Off	On	On	Off	On	On
100 PPS	1 mS	On	Off	On	On	Off	On
1 KPPS	100 μS	Off	Off	On	Off	Off	On
10 KPPS	10 μS	On	On	Off	On	On	Off
100 KPPS	1 μS	Off	On	Off	Off	On	Off
1 MPPS	100 nS	On	Off	Off	On	Off	Off
10 MHz	50 nS	Off	Off	Off	Off	Off	Off

Dipswitch 7 set to on will set all outputs to a 50% duty cycle. Dipswitch 8 is not used and has no effect.

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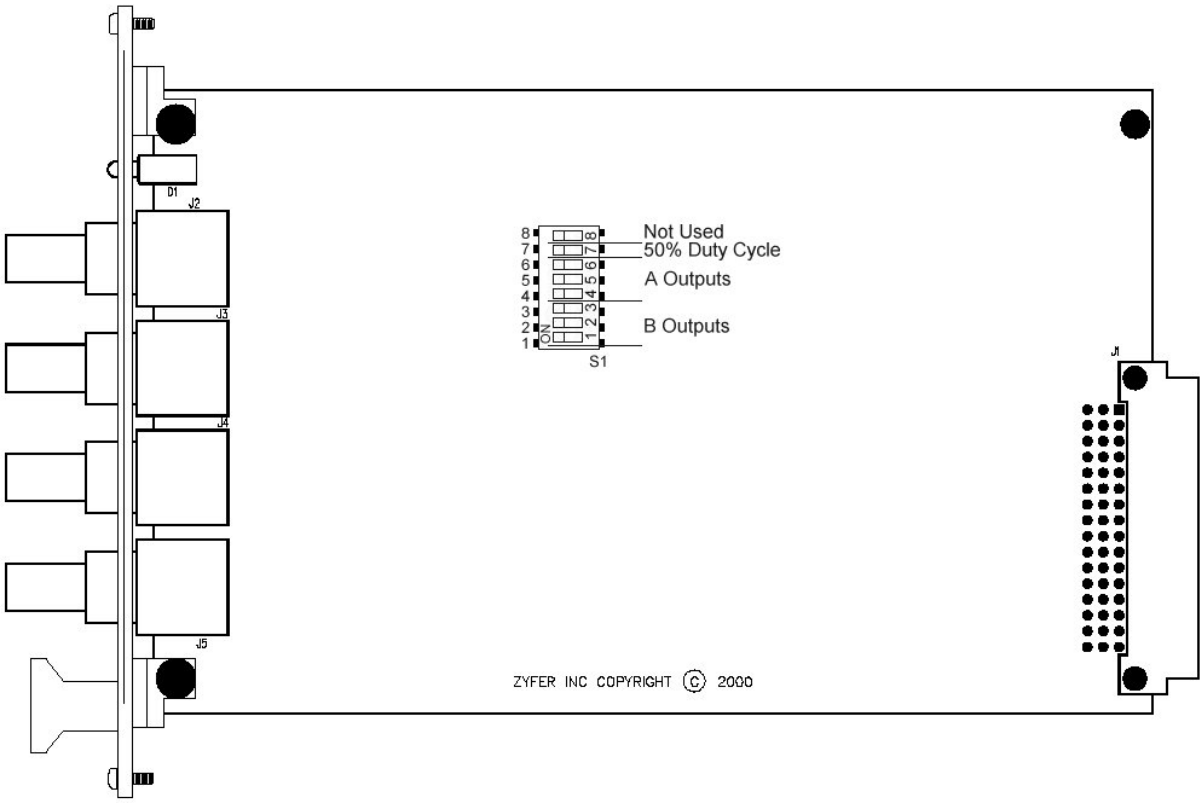

Figure 5 Pulse Rate Output Module Switch Location

2.4 Status

The status of the Pulse Rate Output Module can be obtained from the GTF module SSTA message or viewed from the Front Panel display (Menu 8). The status message consists of an identification number (first byte) in hex format and a bus status message (second byte).

2.4.1 Status Message

ID	Status
0x61	Bit7 = 1PPS or 10 MHz Input Fault (0=no fault) Bit6 = Output Synchronization Fault (0=no fault) Bits5,4,3 = Selected output rate for top two output connectors (DSW6/5/4) Bits2,1,0 = Selected output rate for bottom two output connectors (DSW3/2/1)

2.4.2 Front Panel Display (Example)

```
Slot 3  Pulse Rate Output        0x61  ≡
Status: 0x15
```

In this example, a status of 0x15 indicates that the A Outputs are set for 100 PPS, the B Outputs are set for 100 KPPS, and there are no faults.

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2.4.3 Commands

There are no commands specific to this output module.

2.5 Specifications

The pulse output signals are synchronized to the 1 PPS and phase-coherent to the 10 MHz reference signals generated by the online GTF module; therefore, the output signals have the same accuracy and stability as the online GTF module's generated signal connected to the module through the system's passive backplane.

Number of Outputs 4
Connector Type ..... BNC female
Rate ..... User Selected
Synchronization Reference ..... UTC
Synchronization ..... Rising (leading) edge on-time
Source Impedance ..... 50 Ω nominal
Output Drive
- High Level ..... ≥ +4.0 V into 50 Ω load
- Low Level ..... ≤ +0.2 V into 50 Ω load

Protection ..... Short circuit proof

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T1/E1 Quad Output Module 385-4034

The T1/E1 Quad Output Module provides four all 1's outputs in T1/DS1 D4, T1/DS1 ESF (Extended Super Frame) or E1 formats. Modules can be installed in any slot from 3 through 15 (slots 1 through 4 in GSync). Each module is "hot swappable". It can be removed or installed without removing power from the CommSync II system or interrupting operations.

2.1 LED Status Indicators

The module's LEDs indicate the status of the module.

- The Green LED indicates power to the module.
- The Red LED is the Alarm indicator that illuminates when there is a fault in the reference frequency from the online GTF module and/or when the module's DDS has a fault.

2.2 Output Configuration

The module provides four transformer-coupled outputs on four RJ-45 connectors, four BNC connectors, two D-Subminiature connectors, or wire-wrap posts. The following matrix indicates which module version uses which type of output configuration.

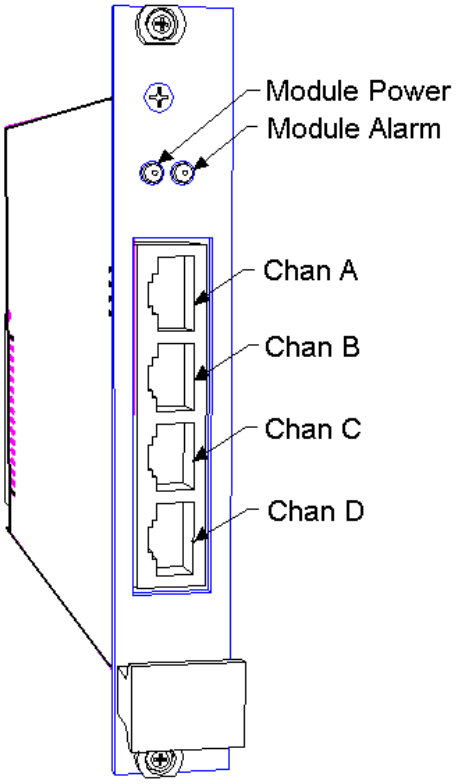
Part Number	Output	Connector
385-4034-01	1 per connector	4 x RJ-45
385-4034-02	1 per connector	4 x BNC
385-4034-03	2 per connector	2 x DE-9
385-4034-04	1 per post pair	8 x Wire-Wrap posts

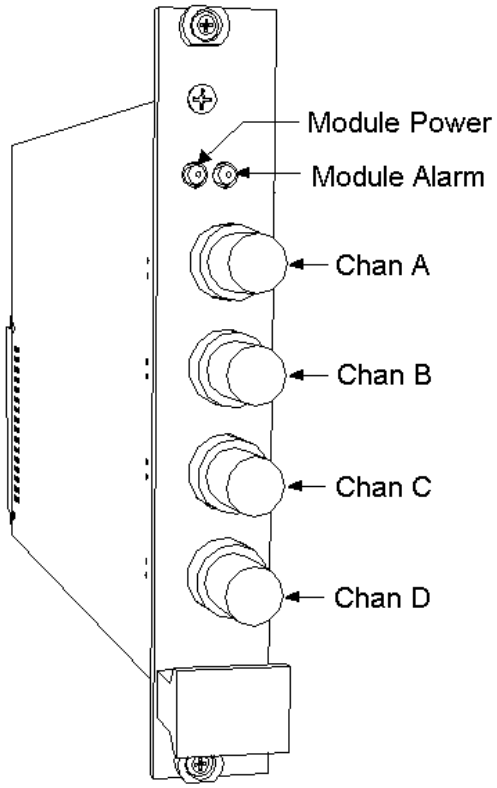
2.3 Output Connector Options

2.3.1 RJ-45 Connectors

If the module is configured with RJ-45 output connectors, then the pin designation of each connector is as follows:

Output	Connector Contact
TTIP	Pin 5
TRING	Pin 4
NC	Pin 1, 2, 3, 6, 7, 8





2.3.2 BNC Connectors

If the module is configured with BNC output connectors, then the output channel designation is as follows:

Output	Connector Contact
TTIP	Center
TRING	Shell (Sig. Return/Chassis Gnd)

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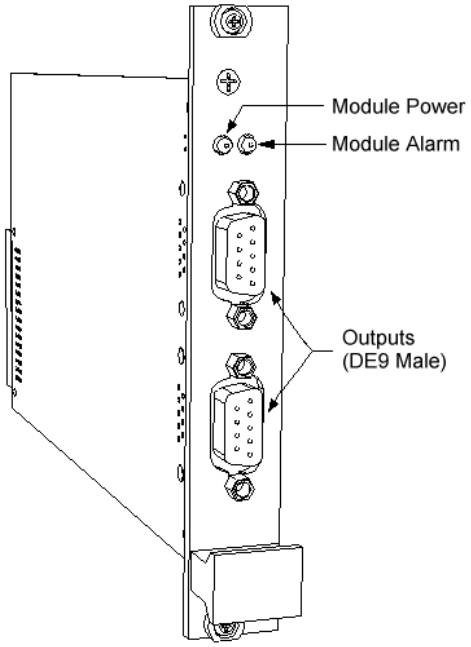
2.3.3 D-Subminiature Output Connectors



If the module is configured with DE-9 (male) connectors, then the connectors are wired the as follows:

- Upper Connector

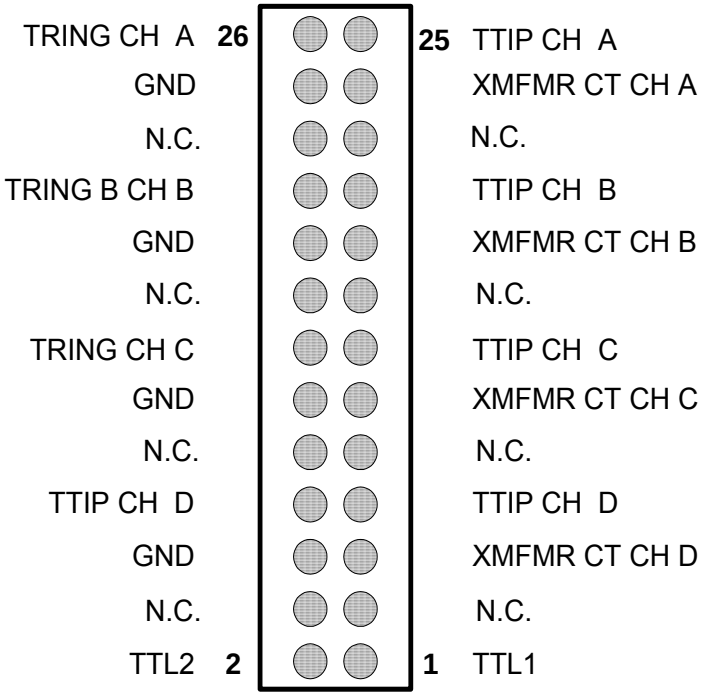
T1 or E1 Output	TTIP	TRING
Chan A	Pin 6	Pin 1
Chan B	Pin 4	Pin 8
TTL1 Sync Output Signal		
High Output	Pin 5	
Signal Com/Return	Pin 3	

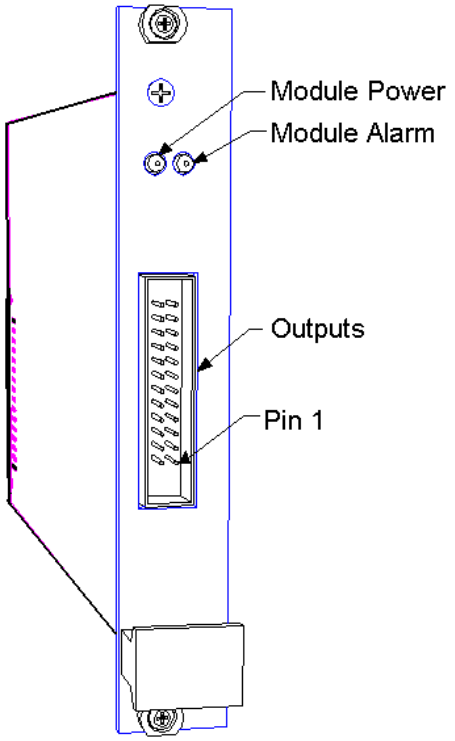
- Lower Connector

T1 or E1 Output	TTIP	TRING
Chan C	Pin 6	Pin 1
Chan D	Pin 4	Pin 8
TTL2 Sync Output Signal		
High Output	Pin 5	
Signal Com/Return	Pin 3	

2.3.4 Wire Wrap Post Output Termination

If the module is configured with wire-wrap post as output signal terminations, then the pin designation is as follows:





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2.4 Configuration/ Dipswitch setup

The module's configuration is determined by a 6-segment dipswitches (S1 through S4) and two jumper locations near the center of the module. At power-up, the module initializes to the configuration that is selected by the dipswitch segment settings and jumper plug selections. See Figure 6 for dip-switch and jumper locations.

Four 6-segment dipswitches are used to configure each output channel. Channel A is controlled by S1, Channel B by S2, Channel C by S3, and Channel D by S4.

Segments 1 through 3 of each dipswitch select the line output compensation:

Line Build Out Select (T1 Configuration)			
Segment			Line Length
1	2	3	
ON	ON	ON	0-133 ft (DSX-1)
OFF	ON	ON	133-266 ft (DSX-1)
ON	OFF	ON	266-399 ft (DSX-1)
OFF	OFF	ON	399-533 ft (DSX-1)
ON	ON	OFF	533-655 ft (DSX-1)
OFF	ON	OFF	-7.5 dB (CSU)
ON	OFF	OFF	-15 dB (CSU)
OFF	OFF	OFF	-22.5 dB (CSU)

Line Build Out Select (E1 Configuration)			
Segment			Line Length
1	2	3	
ON	ON	ON	75 Ω normal
OFF	ON	ON	120 Ω normal
ON	ON	OFF	75 Ω w/high return loss
OFF	ON	OFF	120 Ω w/high return loss

Segment 4, 5, and 6 of each dipswitch select the signal framing:

Segment 4	Segment 5	Segment 6	Output
ON	ON	ON	Framed all 1's
OFF	ON	ON	Pseudo Random
ON	OFF	ON	Alternating 1 and 0
OFF	OFF	ON	Unframed All 1's
Don't Care	Don't Care	OFF	Bi-Polar Sync

Jumpers JP1 and JP2 select either T1 or E1 outputs:

JP1	JP2	Output
Open	Don't Care	E1 (CRC4)
Installed	Installed	T1 Super Frame
Installed	Open	T1 Extended Super Frame (CRC6)

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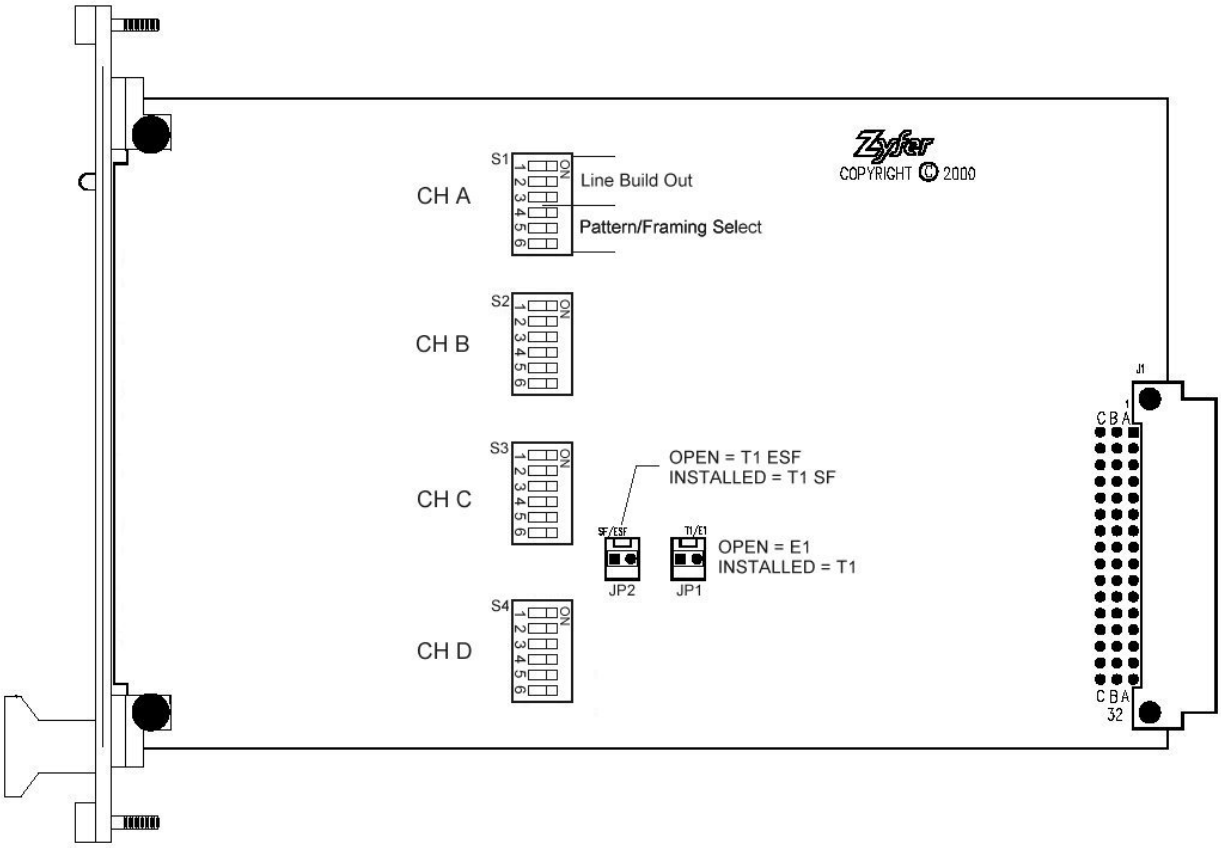

Figure 6 T1/E1 Switch and Jumper Locations

2.5 Status

The status of the T1/E1 Quad Output Module can be obtained from the GTF module SSTA message or viewed from the Front Panel display (Menu 8). The status message consists of an identification number (first byte) in hex format and a bus status message (second byte).

2.5.1 Status Message

Dash Number	ID	Status
-01	0x41	Fault bit is in ID. If ID is 49 = Module Fault Status Byte: C0 = T1; FF = E1
-02	0x41	
-03	0x41	
-04	0x41	

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2.5.2 Front Panel Display (Example)

```
Slot 12 Framed T1/E1 4-Output      0x41 ≡
Status: 0xFF 2.048 MHz
```

2.5.3 Commands

There are no commands specific to this module.

2.6 Specifications

The output signals meet the applicable requirements of ITU standards G.703, G.704, G.706, ANSI standards T1.403-1999, T1.408, and AT&T TR 62411.

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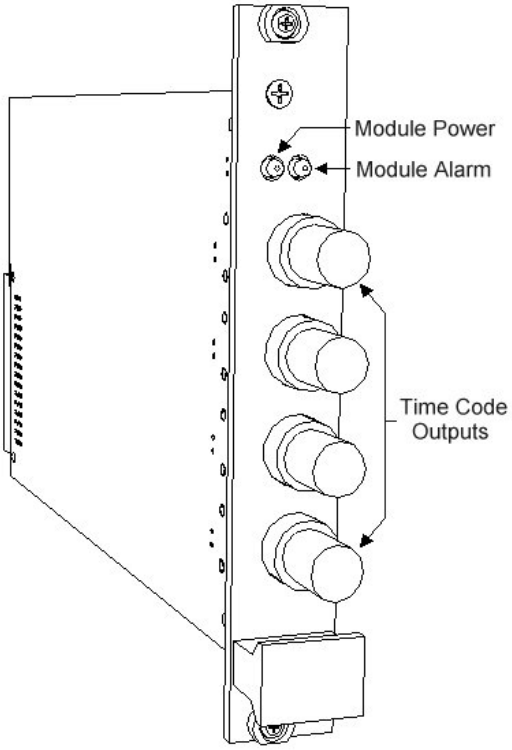
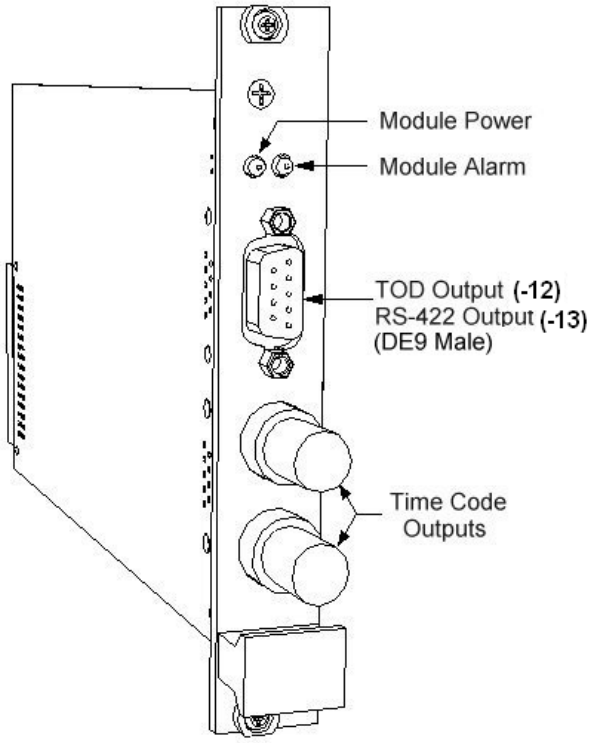
Time Code Output Module 385-4020

The Time Code Output Module provides time information through formatted output signals and, with the -12 module version, an RS-232 compatible Time Of Day (TOD) serial output string. The module derives its time information from the online GTF module via the CommSync II backplane connector. Modules can be installed in any slot from 3 through 15 (slots 1 through 4 in GSync). Each module is "hot swappable". It can be removed or installed without removing power from the CommSync II System or interrupting operations. Each module contains the necessary logic to minimize the effects of a fault-induced switchover.



-11



-12, -13

2.1 LED Status Indicators

The module's LEDs indicate the status of the module.

- The Green LED indicates power to the module.
- The Red LED is the Alarm indicator and illuminates when there is a fault in the reference signals from the online GTF module and/or when a fault has been detected on the Time Code module.

2.2 Output Configurations

The Time Code module is available in three versions.

2.2.1 Configurations

The following matrix indicates the outputs and connector types for each dash number:

Part Number	Output	Connector
385-4020-11	4 x Time Code (AM and/or DC-Shift)	4 x BNC
385-4020-12	2 x Time Code (AM and/or DC-Shift) 1 x Serial TOD	2 x BNC 1 x DE-9
385-4020-13	2 x Time Code (AM and/or DC-Shift) 3 x RS-422	2 x BNC 1 x DE-9

2.2.2 RS-422 Output Connector

The following table gives the pinout of the DE-9 connector for the -03:

Outputs	(+)	(-)
#1	Pin 1	Pin 6
#2	Pin 7	Pin 8
#3	Pin 5	Pin 9
Sig Com/Return	Pins 2, 3, 4	

2.3 Output Code Type and Format Selection

The module contains a code generator that simultaneously drives the multiple BNC time code output connectors. Each connector output is user configurable via jumper plugs to provide either Amplitude Modulated or DC-Shift code output type. The time code output format is also user configurable via jumper plugs, one format at a time. See Figure 7 for locations of jumpers.

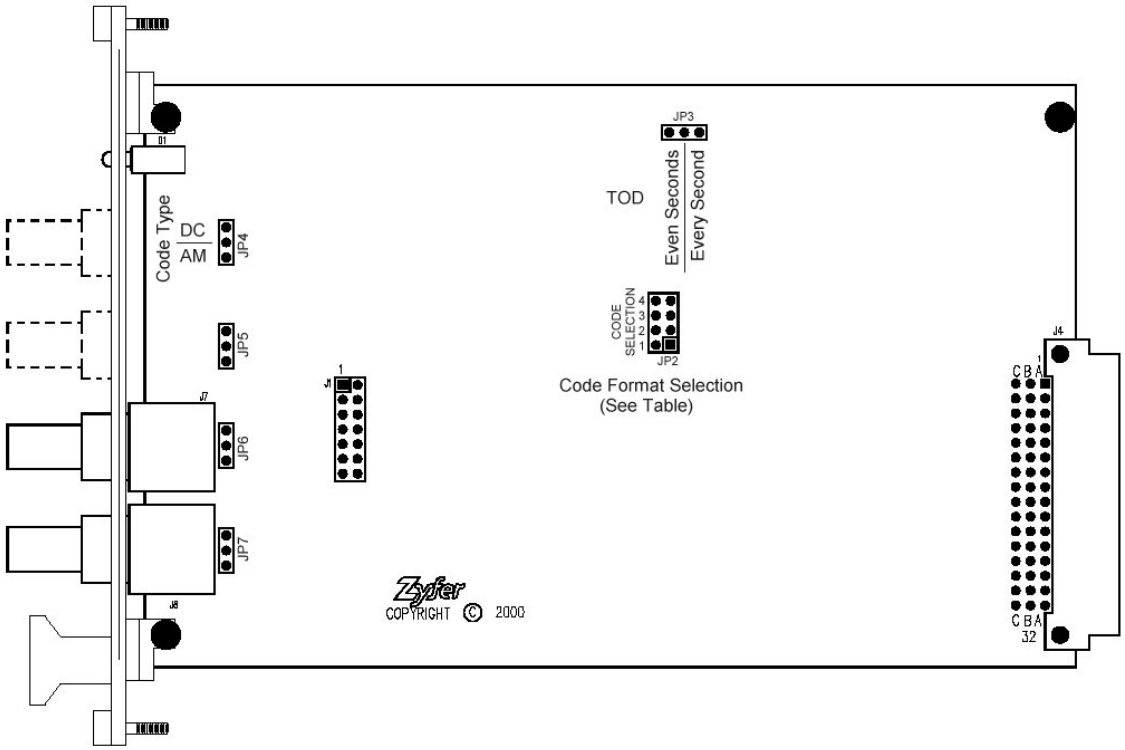


Figure 7 Time Code Output Module Jumper Locations

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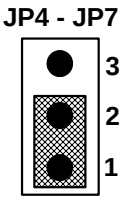
2.3.1 Code Type

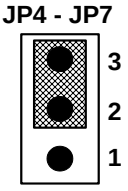
The code type, AM or DC, can be selected individually at each of the four output ports by means of jumper plugs JP4 through JP7. JP4 is located near the upper BNC connector.

2.3.2 Amplitude Modulated Code



To select AM (Amplitude Modulated) code output type, place the removable jumper between Pin 1 and Pin 2 of the header associated with the output port to be configured for AM code output type, as shown in the illustration.

2.3.3 DC-Shift Code

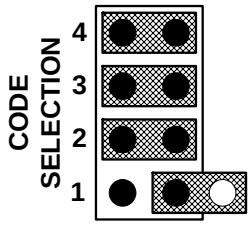


To select DC-Shift code output type, place the removable jumper between the Pin 2 and Pin 3 of the header associated with the output port to be configured for DC-Shift code output type, as shown in the illustration.

2.3.4 Code Format

To select the code output format, install the jumpers at header JP2 as follows:

385-3018 Module Firmware version	CODE OUTPUT FORMAT	JP2 JUMPER(S) NOT INSTALLED*	JP2 JUMPER(S) INSTALLED
V1.00.00	IRIG-B122		1, 2, 3, 4
	IRIG-B123	1, 3	2, 4
	IRIG-A132	1	2, 3, 4
	NASA 36	2	1, 3, 4
	2137	1, 2	3, 4
	IEEE 1344-1995	3	1, 2, 4
V1.01.00 adds	IRIG -B126	2, 3	1, 4
	IRIG-B127	1,2,3	4

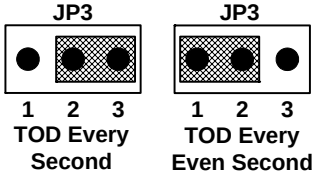


When a jumper is “not installed”, install it using only one pin, as shown in the pictorial.

Note: IRIG-A is selected in the above example. The factory default is IRIG-B122.

2.4 TOD Output Transmission Rate Selection (-02)

The transmission rate of the RS-232 Time Of Day (TOD) serial output string (-02 only) can be selected on a module version configured with the serial output. Select the rate as follows:



TRANSMISSION RATE	JP3 JUMPER
Every second	2 to 3
Even seconds only	1 to 2

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2.5 Time Offset Selection

The module's output time can be offset from UTC through the front panel keypad or through commands via the I/O port.

2.5.1 Front Panel

To access the display screen of a module through the keypad/display:

- Select Menu 8 by pressing MENU and then key 8.
- Press EDIT while the screen is cycling through the various output modules.
- Press the arrow keys to select the Time Code module.
- Press the EDIT key to edit of the time offset from UTC for the selected module.
- Press the arrow keys to select the polarity of the offset, and then press ENTER.
- Press the arrow keys to select the hours offset, then press ENTER.
- Press the arrow keys to select the minutes of offset (0 or 30), and then press ENTER to select the new time offset.
- Press the arrow keys to select the next module's status screen, or:
- Press the ENTER or MENU key to continue to cycle through the output module status screens, or:

2.5.2 Command

The $TCOD* command can also be used to select/change the module's time offset from UTC. See the protocol document 385-8002 for further information.

2.6 Module Status and Configuration

The ID, and status are reported via serial interface port in SSTA message (see 385-8002, Serial Command Protocol) and the KDC. The following screen is an example of a typical Time Code module display (menu 8).

```
Slot 12 IRIG B122 Output          0x51 ≡
Status: 0x40                  Offset:-8:00
```

The upper right display gives the module identification in hex. The lower left-hand data displays the module status and configuration (in HEX). The table below describes the module ID's and status codes.

Dash Number	Mod ID	Status							
		b7	b6	b5	b4	b3	b2	b1	b0
-11	0x51	Time Valid Fault 0=Valid 1=Fault	1=TOD every second 0=TOD even seconds	Output Code selection: 0 0 0 0 IRIG B122 0 0 0 1 IRIG A132 0 0 1 0 NASA 36 0 0 1 1 2137 0 1 0 0 IEEE 1344-1995 0 1 0 1 IRIG B123 0 1 1 0 IRIG B126 0 1 1 1 IRIG B127				IRIG Module Fault 1=Fault	N/A Always zero
-12	0x50								
-13	0x51								

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2.7 Specifications

All versions of the module can provide Amplitude Modulated (AM) and DC-Shift (DC) output type signals with different code formats. Both the code type and format are jumper selected. The -12 version also provides a serial Time Of Day (TOD) message. The -13 version provides 3 RS-422 outputs in the format selected by the user (without amplitude modulation or DC-shift).

2.7.1 Time Code Output

Outputs
Connector ..... BNC female
385-4020-11 4
385-4020-12 2
385-4020-13 2
Time Reference ..... UTC (after Time Lock)
Local Time Offset ..... 0 to +/-14.5 Hrs (User selected)
Amplitude Modulated Output
Time Code Format ..... IRIG-A132, IRIG-B122, -B123, -B126, -B127,
(Format-Jumper selected) 2137, NASA36, and IEEE 1344-1995*
(Factory default: IRIG-B122)
Mark Amplitude ..... 3.5 $\pm$ 0.5 V p-p into 50 Ω
(5 V p-p nominal into 600 Ω)
Mark to Space Ratio ..... 3.3:1 $\pm$ 10%
Output Impedance ..... 50 Ω nominal
Protection ..... Short circuit proof
DC Shift Code Output
Time Code Format ..... IRIG-A132, IRIG-B122, -B123, -B126, -B127,
(Format-Jumper selected) 2137, NASA36, and IEEE 1344-1995*
Output Levels into 50 Ω
High ..... $\geq$ +2.5 VDC
Low ..... < +0.5 VDC
Protection ..... Short circuit proof

-13 Only

Connector Type ..... 9-contact male D-Subminiature
Outputs 3
Time Code Format ..... IRIG-A132, IRIG-B122, -B123, -B126, -B127,
(Format-Jumper selected) 2137, NASA36, and IEEE 1344-1995*
Output Levels into 120 Ω ..... > 3 Vpp differential
(meets EIA standards RS-422 and RS-485)

**Note: the IRIG-B122/IEEE 1344-1995 is encoded with BCD Units and Tens of Year, Leap Second Pending (LSP) and Polarity (LP), Daylight Savings Pending (DSP) and Time (DST), Local time offset, Time quality, and Parity.*

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2.7.2 Time Of Day Serial Output (-12)

Signal RS-232E
Connector ..... 9-contact male D-Subminiature (Pin 2 = Tx, Pin 5 = GND)
Baud Rate 9600
Protocol ..... 1 start bit, 8 data bits, no parity, 1 stop bit
Time Tag ..... Previous 1 PPS
Time Reference ..... Same as system time
Transmit Rate ..... Once per second or even seconds (Jumper selected)
Output message ..... !TIME,Y,D,H,M,S,T,Q,O<cs|cr|lf>

Description		Field details are:
!		On-time character: Rising edge of the first character bit occurs within 1 mS after the rising edge of the system's 1 PPS reference output.
Y	0000 to 9999	Year
D	1 - 366	Day of Year
H	0 - 23	Hours
M	0 - 59	Minutes
S	0 - 59	Seconds (At Leap Seconds radix to 60)
T	1 - 5	Time Mode, where: 1 = GPS Time 2 = UTC Time 3 = LUTC (Local UTC) Time 4 = LGPS (Local GPS) Time 5 = MAN (Manual Time)
Q	4 - 9	Time Quality (TFOM) (See Time Figure of Merit Table)
O	0 - 4	Operation Mode, where: 0 = Warm-up 1 = Time Locked 2 = Holdover (Coasting) 3 = Recovering 4 = Manual (Manual Time)

Time Figure Of Merit Table			
TFOM	Worst Case Time Error		TFOM
1	≤ 1 nS	≤ 1 mS	7
2	≤ 10 nS	≤ 10 mS	8
3	≤ 100 nS	≤ 100 mS	9
4	≤ 1 μS	≤ 1 S	A
5	≤ 10 μS	≤ 10 S	B
6	≤ 100 μS	Fault	F

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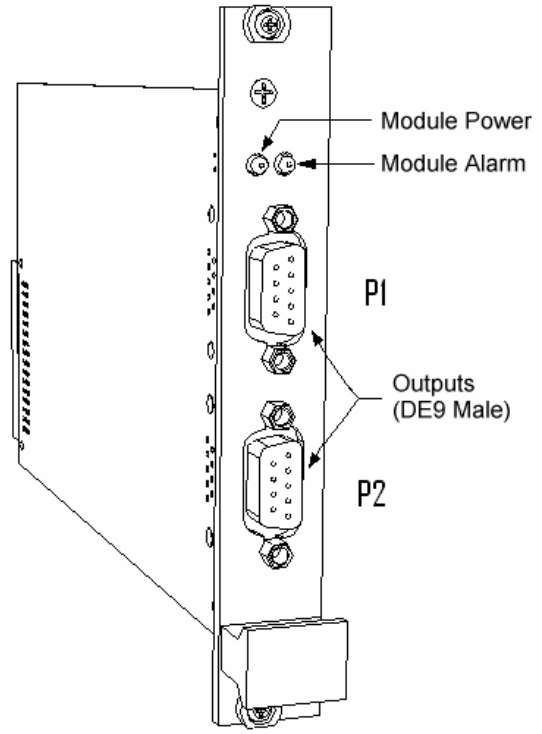
Have Quick Output Module 385-4070

The Have Quick Output Module provides Have Quick time as well as other required signals. Modules can be installed in any slot from 3 through 15 (slots 1 through 4 in GSync). Each module is “hot swappable”. It can be removed or installed without removing power from the CommSync II system or interrupting operations.

2.1 LED Status Indicators

The module’s LEDs indicate the status of the module.

- The Green LED indicates the module uP is running, and power is applied to the module
- The Red LED is the Alarm indicator and illuminates when there is a fault in the reference time from the online GTF module and/or when a fault has been detected on the module.



2.2 Output Configuration

The module provides two DE-9 female connectors, each with identical outputs.

The table below details the outputs for either module:

Connector Pin Out table

385-4070-01								
Have Quick Output Module								
P1 outputs					P2 outputs			
1	+5VDC	6	Have-Quick (#1)		1	+5VDC	6	Have-Quick (#3)
2	800 KPPS (#1)	7	Have-Quick (#2)		2	800 KPPS (#3)	7	Have-Quick (#4)
3	800 KPPS (#2)	8	Clk-Enable (#1)		3	800 KPPS (#4)	8	Clk-Enable (#3)
4	Sig Com (Rtn)	9	Clk-Enable (#2)		4	Sig Com (Rtn)	9	Clk-Enable (#4)
5	Sig Com (Shld)				5	Sig Com (Shld)		

385-4070-02 *Note: identical outputs, both connectors*			
PTTI Output Module			
1	Sig Com	6	BCD (-)
2	BCD (+)	7	Sig Com
3	Have Quick	8	Time Fault
4	1 PPM	9	1 PPS
5	Sig Com		

385-4070-03								
Have Quick Output Module V.11								
P1 outputs					P2 outputs			
1	Sig Com (Shld)	6	Have-Quick (-)		1	Sig Com (Shld)	6	Have-Quick (-)
2	Have-Quick (+)	7	Time Fault		2	Have-Quick (+)	7	Time Fault
3	800 KPPS	8	Clk-Enable (#1)		3	800 KPPS	8	Clk-Enable (#3)
4	1 PPS (+)	9	1 PPS (-)		4	1 PPS (+)	9	1 PPS (-)
5	Sig Com (Shld)				5	Sig Com (Shld)		

2.3 Status

The status of the Have Quick Output Module can be obtained through the system status message (SSTA) or viewed on the Front Panel display (Menu 8). The status message consists of an identification number (first byte) in hex format and a bus status message (second byte).

2.3.1 Status Message details

ID	Status
0x58 385-4070-01 385-4070-03 Have Quick Output Module	Bit7 = Time Fault (RED LED) Bit6 = Module Fault (GRN LED off) Bit5 = Have Quick format select B1 Bit4 = Have Quick format select B0 Bit3 = Clk Enable 4 Bit2 = Clk Enable 3 Bit1 = Clk Enable 2 Bit0 = Clk Enable 1
0x59 385-4070-02 PTTI HQ Output Module	Bit7 = Time Fault (RED LED) Bit6 = Module Fault (GRN LED off) Bit5 = Have Quick format select B1 Bit4 = Have Quick format select B0 Bit3-0 = Not Used, set to zero

Have Quick format select		
B0	B1	Have Quick format
0	0	PTTI HQ (GPS-ICD-060)
1	0	PTTI HQ (GPS-ICD-060)
0	1	HQ II (Stanag 4246)
1	1	Ext HQ (Stanag 4430)

2.3.2 Front Panel Display (Example)

```
Slot 7  HaveQuick Output Module  0x58 ≡
Status: 0x36  CKEn:0,1,1,0   Type:ExtHQ
```

In the above example, a status of 0x36 indicates the module is reporting no faults, the format is set to Extended Have-quick (Stanag 4430) and Clock Enables are set for outputs 2 and 3.

2.3.3 Commands

The HQTS command can be used to select the Have-Quick output format. For instance, the $HQTS,3,1* command, will set a Have-Quick output Module in slot 3 to output the PTTI Have-Quick (GPS-ICD-060) output format.

For the 385-4070-01 and 385-4070-03 modules, the $HQTC command is used to set Clock Enable outputs. For example the $HQTC,6,x,1,x,x* command will set the Clock enable #2, on the Have-Quick output module in slot 6. See the protocol document 385-8002 for further information.

Note: The 385-4070-03 has Clock Enable Ounputs #1, and #3 only. Commands to set Clock Enable outputs #2 and #4 will have no effect.

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2.4 Specifications

2.4.1 385-4070-01 Outputs

The output signals are synchronized to the 1 PPS generated by the online GTF module; therefore, the output signals have the same accuracy and stability as the online GTF.

Connector Type ..... 2x 9-contact female D-Subminiature (DE-9S)

HAVE QUICK OUT*
- Number of Outputs ..... 4 total, 2 per connector (pins 6, 7)
- Format (user selectable) ..... PTTI Have Quick per ICD-GPS-060
  Have Quick II per STANAG 4246
  Extended Have Quick per STANAG 4430
- Accuracy ..... Aligned to 1 PPS < 10 μS

Output Drive
- High ..... +4.5 V to +5.5 V into 50 Ω load
- Low ..... ≤ +0.5 V into 50 Ω load

**Note: Have-Quick Time Code is output continuously after Time is Valid.*

800 KPPS OUT
- Description ..... 800 KPPS Square Wave
- Number of Outputs ..... 4 total, 2 per connector (pins 2, 3)

Output Drive
- High ..... +4.5 V to +5.5 V into 50 Ω load
- Low ..... ≤ +0.5 V into 50 Ω load

EXTERNAL CLOCK (800 KPPS) ENABLE OUT*
- Description ..... Set by the user
- Number of Outputs ..... 2 per connector (pins 8, 9)

Output Drive
- High (set) ..... +4.5 V to +5.5 V into 50 Ω load
- Low (clear) ..... ≤ +0.5 V into 50 Ω load

*When set, EXT CLK ENABLE Out is an enable for external systems to use the module's 800 KPPS as reference clock. This function is set or cleared by the user from the front panel or through the command interface.

+5V KEEP ALIVE OUTPUT
- Description ..... Voltage provided to an external device
  Always present when power is applied
- Signal ..... +4.5 VDC to +5.5 VDC at maximum (20 mA)
- Protection ..... Current limited/short-circuit protected (pin 1)

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2.4.2 385-4070-02 (PTTI) Outputs

The output signals are synchronized to the 1 PPS generated by the online GTF module; therefore, the output signals have the same accuracy and stability as the online GTF.

Connector Type ..... 2x 9-contact female D-Subminiature (DE-9S)

HAVE QUICK OUT*
- Number of Outputs ..... 2 total, 1 ea connector (pin 3)
- Format (user selectable) ..... PTTI Have Quick per ICD-GPS-060
  Have Quick II per STANAG 4246
  Extended Have Quick per STANAG 4430
- Accuracy ..... Aligned to 1 PPS < 10 μS

Output Drive
- High ..... +4.5 V to +5.5 V into 50 Ω load
- Low ..... ≤ +0.5 V into 50 Ω load

**Note: Have-Quick Time Code is output continuously after Time is Valid.*

1 PPS, 1 PPM
- Number of Outputs ..... 2 total, 1 ea connector (1PPS pin 9, 1PPM pin 4)
- Rise Time ..... < 20 nS
- Fall Time ..... < 1 μS
- Pulse Width ..... 20 μS ± 1 μS
- Accuracy ..... < 30 ns
- Output Levels
  - High ..... 10 ± 1 VDC
  - Low ..... 0 ± 1 VDC

BCD Time Code** ..... 40-bit serial per ICD-GPS-060
- Number of Outputs ..... 2 total, 1 ea connector (Differential pin 2(+), pin 6(-))
- Accuracy ..... Aligned to 1 PPS < 100 μS from leading edge
- Levels (measured differentially) ..... Logic Zero: -0.1 to -6.0 VDC
  Logic One: 0.1 to 6 VDC

***Note: BCD Time Code is output continuously after Time is Valid.*

TIME FAULT OUTPUT
- Number of Outputs ..... 2 total, 1 ea connector (pin 8)
- Logic Level Format ..... 0=Fault

Output Drive
- High (no fault) ..... +4.5 V to +5.5 V into 50 Ω load
- Low (faulted) ..... ≤ +0.5 V into 50 Ω load

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2.4.3 *385-4070-03 Outputs

The output signals are synchronized to the 1 PPS generated by the online GTF module; therefore, the output signals have the same accuracy and stability as the online GTF.

Connector Type ..... 2x 9-contact female D-Subminiature (DE-9S)

HAVE QUICK OUT*

Format (user selectable) .....PTTI Have Quick per ICD-GPS-060
Have Quick II per STANAG 4246
Extended Have Quick per STANAG 4430

Number of Outputs....2 total, 1 ea connector (Differential pin 2(+), pin 6(-))

Accuracy .....Aligned to 1 PPS < 10 μS from leading edge

Levels (measured differentially) ..... Logic Zero: -0.1 to -6.0 VDC
Logic One: 0.1 to 6 VDC

**Note: HaveQuick Time Code is output continuously after Time is Valid.*

1 PPS

Number of Outputs....2 total, 1 ea connector (Differential pin 4(+), pin 9(-))

Pulse Width..... 20 μS ± 1 μS

Accuracy ..... < 30 ns

Levels (measured differentially) ..... Logic Zero: -0.1 to -6.0 VDC
Logic One: 0.1 to 6 VDC

800 KPPS OUT

Description .....800 KPPS Square Wave

Number of Outputs..... 2 total, 1 per connector (pin 3)

Output Drive

High.....+4.5 V to +5.5 V into 50 Ω load

Low ..... ≤ +0.5 V into 50 Ω load

EXTERNAL CLOCK ENABLE OUT*

Description .....Set by the user

Number of Outputs..... 2 total, 1 per connector (pin 8)

Output Drive

High (set) .....+4.5 V to +5.5 V into 50 Ω load

Low (clear) ..... ≤ +0.5 V into 50 Ω load

*When set, EXT CLK ENABLE Out is an enable for external systems to use the module's 800 KPPS as reference clock. This function is set or cleared by the user from the front panel or through the command interface.

TIME FAULT OUTPUT

Number of Outputs..... 2 total, 1 ea connector (pin 7)

Logic Level Format ..... 0=Fault (time not valid)

Output Drive

High (no fault).....+4.5 V to +5.5 V into 50 Ω load

Low (faulted) ..... ≤ +0.5 V into 50 Ω load

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Dual Network Time (NTP) Module 385-4087

The Dual Network Time (NTP) Output Module provides two independent Ethernet ports that provide Network Time Service using NTP (Network Time Protocol) or SNTP.

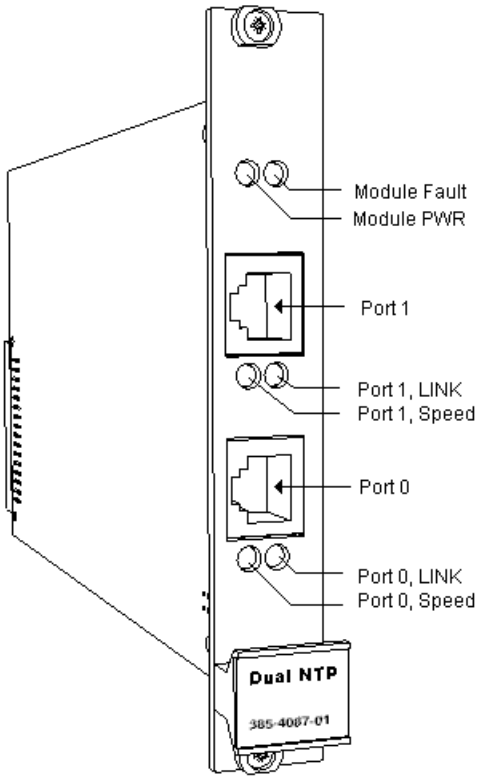
Up to four Dual NTP Modules can be installed in any slot from 3 through 15 (slots 1 through 4 in GSync). Each module is "hot swappable"; meaning that it can be removed or installed without removing power from the CommSyncII system or interrupting operations.

Note: Up to four Dual NTP modules may be installed in a CommSyncII Chassis.

2.1 LED Status Indicators

The module's LEDs indicate the status of the module.

- The Green LED indicates the module is running, and power is applied to the module
- The Red LED is the Alarm indicator and illuminates when there is a fault in the reference time from the online GTF module and/or when a fault has been detected on the module.
- Each output port has two LEDs associated:
- The Right LED indicates Network Link. And illuminates when the module is connected to the network.
- The Left LED illuminates when the network connection detected is 100Base-T. Off indicates 10Base-T connection.
-



2.2 Status

The status of the Dual NTP Module can be obtained from the GTF module SSTA message or viewed from the Front Panel display (Menu 8). The status message consists of an identification number (first byte) in hex format and a bus status message (second byte).

2.2.1 Status Message

ID	Status Byte
0x5F	Bit 7 = Module Time Valid Fault: 0=Valid, 1=Time Fault Bit 6 = DNTP Module not ready :0=Ready, 1=Not Ready Bit 5 = N/A, always 0 Bit 4 = N/A, always 0 Bit 3 = Port 0 Fault: 0 = Port 1 Ready, 1= Port Faulted Bit 2 = Port 1 Fault: 0 = Port 1 Ready, 1= Port Faulted Bit 1 = Module Fault: 1= DNTP module fault Bit 0 = Time not received from GTF: 0=Rcvd Time, 1=not rcvd time

2.2.2 Front Panel Display (Example, menu 8)

```
Slot 5a Dual NTP (port 0)          0x5F ≡
Status: 0x00          IP:010.010.010.201
```

2.3 Dual NTP Module Configuration

Each port on the Dual NTP module must be set independently. This can be accomplished either through the front panel Keypad/Display unit (KDC) or through serial protocol commands.

Note: Before connecting to your local area network (LAN) you should first Obtain an IP Address/Gateway address, and Network Mask from your Network Administrator. Do not choose an address arbitrarily!

2.3.1 Configuring the Module

Setting the IP Address, Gateway, Netmask, and is accomplished either via the front panel menus or the RS-232 factory test port.

From the front panel menus:

Press key '8' (output module menu), then press 'Edit'. Using the arrow keys select the Slot/Port to configure.

Pressing 'Edit' again will move the cursor to the first Octet of the IP address, use the number keys to enter the value, pressing 'Enter' will move the cursor to the next Octet.

Repeat this process until all values are entered.

Front Panel Display (Edit mode Example)

```
Slot 5a Dual NTP (0)  IP:010.010.010.201≡
Msk:255.255.248.000 Gtwy:010.010.010.201
```

Note: The board will reset to make the changes and will automatically restart within approximately 20 seconds.

2.3.2 Serial protocol Configuration Commands

The $DNTI*, $DNTG*, $DNTM*, and $DNTV* commands are used for setting IP Address, Gateway Address, Netmask, and Dual NTP Module software versions.

Note: Each configuration command will reset the port to make the changes and will automatically restart within approximately 20 seconds. While in reset the port will not accept a new configuration command until the port is ready.

See the Serial Command Protocol Document (385-8002) for additional information.

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2.3.3 Configure the IP Address

The command, $DNTI,s,p* (where s=slot, p=port) will request the current IP Address of the installed Dual NTP Modules. To set the IP Address, send $DNTI,s,p,xxx.xxx.xxx.xxx*, (where s=slot, p=port,xxx.xxx.xxx.xxx= IP Address).

2.3.4 Configure the Gateway Address

The command, $DNTG,s,p* (where s=slot,p=port) will request the current Gateway Address of the installed Dual NTP Modules. To set the Gateway Address, send $DNTG,s,p,xxx.xxx.xxx.xxx*, (where s=slot, p=port,xxx.xxx.xxx.xxx= Gateway). *(Note that the Gateway Address must be in the same domain as the IP Address.*)

2.3.5 Configure the Network Mask

The command, $DNTM,s,p* (where s=slot,p=port) will request the current NetMask of the installed Dual NTP Modules. To set the NetMask, send $DNTM,s,p,xxx.xxx.xxx.xxx*, (where s=slot, p=port,xxx.xxx.xxx.xxx= NetMask. (A typical setting for the Network Mask is 255.255.255.0.)

Note: Each configuration command will reset the port to make the changes and will automatically restart within approximately 20 seconds. While in reset the port will not accept a new configuration command until the port is ready.

2.4 Network Time service (NTP) Server Functions

The Dual NTP module supports SNTP (RFC-2030) and NTPv3 (RFC-1119/1305) functions (in server mode) providing UTC time to a network. The Network Time Service (NTS) is available when the system is Time locked and will remain available during Holdover (Coasting) as long as the est. timing error is less than 1 ms (TFOM < 7).

2.5 Specifications

2.5.1 Ethernet Interface

Connector RJ-45
Signal 10/100Base-T
Configuration ..... IP address, netmask and gateway address must be selected by user
Compatibility ..... TCP/IP, Ethernet version 2.0/IEEE 802.3
NTP Support ..... NTP Version 1, 2, 3, and SNTP

Note: The Ethernet/NTP output is first available when the system is Time locked and will remain available during Holdover (Coasting) as long as the timing error is less than 1 ms (TFOM < 7)

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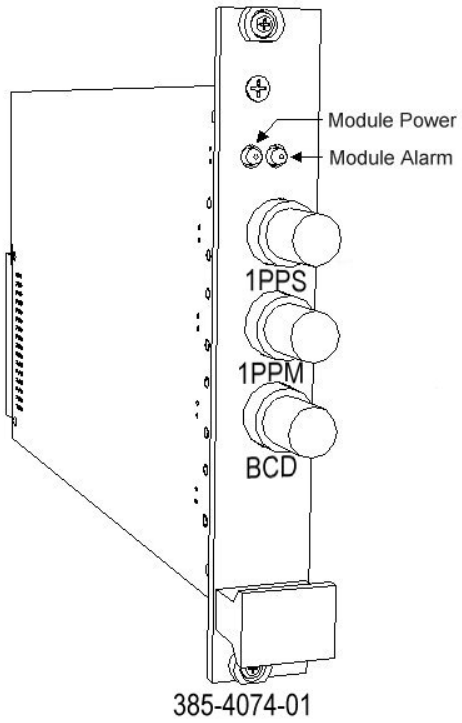
1PPS/1PPM/BCD Output Module 385-4074

The 1PPS/1PPMBCD Output Module provides BCD time 1PPS and 1PPM outputs. Modules can be installed in any slot from 3 through 15 (slots 1 through 4 in GSync). Each module is “hot swappable”. It can be removed or installed without removing power from the CommSync II system or interrupting operations.

2.1 LED Status Indicators

The module’s LEDs indicate the status of the module.

- The Green LED indicates power to the module.
- The Red LED is the Alarm indicator that illuminates when there is a fault in the reference frequency from the online GTF module and/or when the module has a fault.



2.2 Output Configuration

The 1PPS/1PPM/BCD Output Module has three BNC female connectors. Each connector is marked with the output. These outputs are 1 PPS, 1 PPM, and BCD time.

2.3 Status

The status of the PTTI BCD Output Module can be obtained from the GTF module SSTA message or viewed from the Front Panel display (Menu 8). The status message consists of an identification number (first byte) in hex format and a bus status message (second byte).

2.3.1 Status Message

ID	Status
0x5A	Bit7 = Time Fault Bit1 = Module Fault

2.3.2 Front Panel Display (Example)

```
Slot 7  PTTI BCD Output Module  0x5A  ≡
Status: 0x02
```

In this example, a status of 0x02 bit 1 is set, indicating a module fault.

2.3.3 Commands

There are no commands specific to this output module.

2.4 Specifications

Number of Connectors 3
Synchronization Reference ..... UTC (after time lock)
Synchronization ..... Rising (leading) edge on-time
Protection ..... Short circuit proof
Outputs ..... 1 PPS, 1 PPM, BCD Time Code

1 PPS, 1 PPM
- Rise Time ..... < 20 nS
- Fall Time ..... < 1 μS
- Pulse Width ..... 20 μS ± 1 μS
- Accuracy ..... < 30 ns
- Output Levels
  - High ..... 10 ± 1 VDC
  - Low ..... 0 ± 1 VDC

BCD Time Code ..... 24-bit serial per DOD-STD-1399
- Accuracy ..... Aligned to 1 PPS < 100 μS from leading edge
- Levels ..... Logic Zero: -6.0 ± 1 VDC
  Logic One: 6 ± 1 VDC

Note: BCD Time Code is output continuously after Time is Valid.

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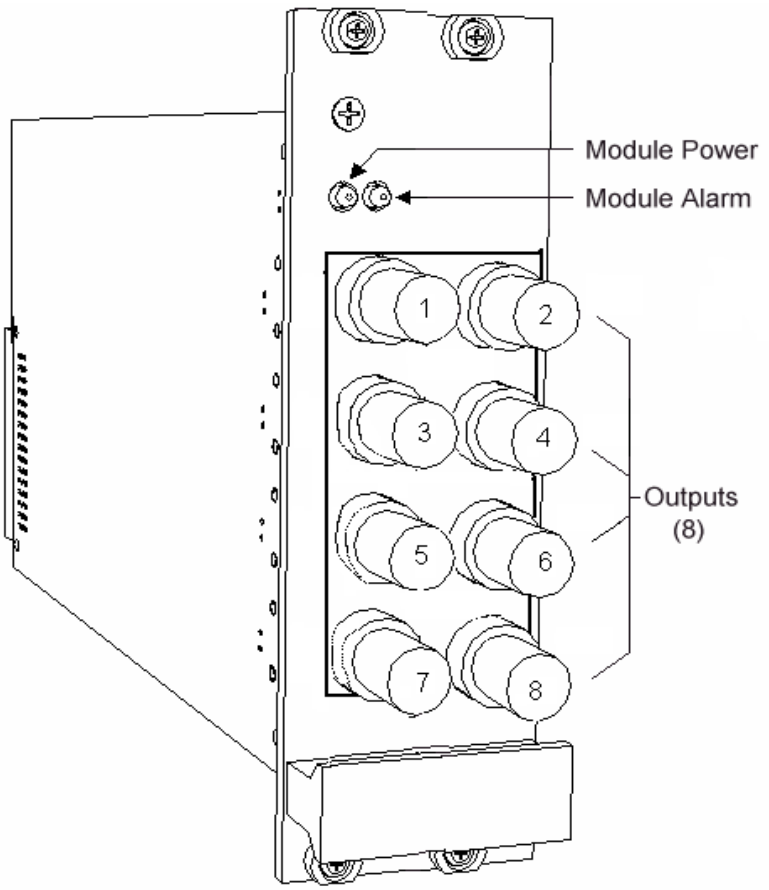
Phase Aligned Low Profile LPN Sine Wave Output Module 385-4078

The Phase Aligned Low Phase Noise Sine Wave Output Modules provide eight 10 MHz low phase noise frequency outputs that are phase coherent to the system's 1 PPS outputs. Modules can be installed in any slot from 3 through 15. For GSync, the module may be installed in either Slot 2 or Slot 4. Each module is "hot swappable". It can be removed or installed without removing power from the CommSync II System or interrupting operations. Each module contains a VCXO and the necessary logic to



minimize the effects of a fault induced switchover.

2.1 LED Status Indicators

The module's LEDs indicate the status of the module.

- The Green LED indicates power to the module.
- The Red LED is the Alarm indicator that illuminates when there is a fault in the reference signal from the online GTF module and/or the module's VCXO.

  The Red LED may blink once per second for a short time at start up.

2.2 Output Configuration

The module provides eight 50 Ω sine wave output signals at a frequency of 10 MHz. The following matrix indicates which dash number produces which output frequency and output level:

MODULE CONFIGURATION		
Dash Number	Output Frequency	Output Power
-02	10 MHz	13 dBm
-12	10 MHz	13 dBm

2.3 Status

The status of the Phase Aligned Low Phase Noise Sine Wave Output Module can be obtained from the GTF module SSTA message or viewed from the Front Panel display (Menu 8). The status message consists of an identification number (first byte) in hex format and a bus status message (second byte).

2.3.1 Status Message

Dash Number	ID	Status
-02	0x71	Bit7=Synchronization Fault Bit6=Frequency In Fault Bit5=Osc. End of Life Fault This bit indicates the control voltage to the oscillator is out of the useable range.
-12	0x71	

2.3.2 Front Panel Display (Example)

```
Slot 5  Low-Profile Aligned LPN   0x71 ≡
Status: 0x00 No Faults
```

2.3.3 Commands

Command: $PHAC,S*<cr|lf>

Response: $PHAC,S,E,P,V,sp*<cs|cr|lf>

Description: Reads Calibration variables of a Phase Aligned Output Module in specific Cs2/GSync slot

Fields:	Symbol	Range	Description
S		1-15	Output Module Slot Number
E		0-1	0=Auto Adjust disabled, 1,2=not locked, 3=Locked
P		0-255	Phase Adjust delay setting (1nS/step *)
V		0.00-5.00	Phase Detect Voltage

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sp 0.00-5.00 Phase Alignment Set Point

Command: $PHAC,S,E,P,sp*<cr|lf>

Response: $PHAC,S,E,P,sp*<cs|cr|lf>

Description: Sets Calibration variables of a Phase Aligned Output Module in specific Cs2/GSync slot

Fields: Symbol Range Description

S 1-15 Output Module Slot Number

E 0-1 0=Disable Auto Phase Adjust, 1=Enable

P 0-255 Phase Adjust delay setting (1nS/step *)

sp 0.00-5.00 Phase Alignment Set Point

2.4 Specifications

The output rising edges are phase aligned within < 15 ns with the 1 PPS output module and synchronized to the 10 MHz signal generated by the system's online GTF module; therefore, the output signals have the same phase ,accuracy and stability as the online GTF module's generated signal connected to the module through the system's passive backplane.

Unless otherwise stated, the following specifications apply when the internal oscillator has been disciplined for at least 2 days.

All versions provide eight (8) output signals through BNC connectors. The primary difference between the versions is the output signal frequency and the output signal level.

Number of Outputs 8
Connector Type ..... BNC female
Phase alignment between output rising edge & 1 PPS output module. < 15 ns
Sine wave Alignment ..... within 5 ns
Frequency
385-4078-02,-12..... 10 MHz
Wave Shape ..... Sinusoid
Amplitude into 50 Ω
385-4078--02,-12 ..... 13 +4, -1 dBm
Harmonics ..... < -50 dBc
Spurious Noise ..... < -60 dBc
Coupling ..... AC
Source Impedance ..... 50 Ω nominal
Protection ..... Short circuit proof
Allan Variance (Based upon GTF OSC type):

	Rubidium GTF	OCXO GTF
1 Sec	< 3E-11	< 1E-11
10 Sec	< 1E-11	< 1E-11
100 Sec	< 3E-12	< 1E-10

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Phase Noise (5 MHz Module) (typical):

	Rubidium GTF	OCXO GTF
@ 1 Hz	< -90 dBc/Hz	< -90 dBc/Hz
@ 10 Hz	< -120 dBc/Hz	< -120 dBc/Hz
@ 100 Hz	< -135 dBc/Hz	< -135 dBc/Hz
@ 1 kHz	< -145 dBc/Hz	< -145 dBc/Hz
@ 10 kHz	< -150 dBc/Hz	< -150 dBc/Hz

Phase Noise (10 MHz Module) (typical):

	Rubidium GTF	OCXO GTF
@ 1 Hz	< -90 dBc/Hz	< -90 dBc/Hz
@ 10 Hz	< -120 dBc/Hz	< -120 dBc/Hz
@ 100 Hz	< -135 dBc/Hz	< -135 dBc/Hz
@ 1 kHz	< -145 dBc/Hz	< -145 dBc/Hz
@ 10 kHz	< -150 dBc/Hz	< -150 dBc/Hz

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Phase Aligned 1 PPS/Multiple Sine Wave Output Module 385-4081

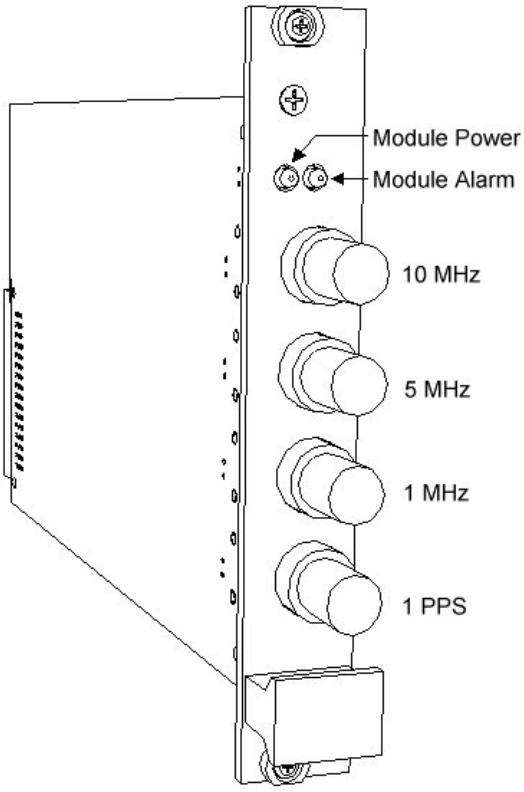
The Phase Aligned Multiple Sine Wave Output Module provides four frequencies, 1 PPS, 1 MHz, 5 MHz and 10 MHz sine wave outputs (1 output each frequency).The sine wave outputs are phase coherent to the system's 1 PPS outputs. Modules can be installed in any slot from 3 through 15. For GSync, the module may be installed in any of the four available slots. Each module is "hot swappable". It can be removed or installed without removing power from the CommSync II System or interrupting operations. Each module contains a VCXO and the necessary logic to minimize the effects of a fault induced switchover.

2.1 LED Status Indicators

The module's LEDs indicate the status of the module.

- The Green LED indicates power to the module.
- The Red LED is the Alarm indicator that illuminates when there is a fault in the reference signal from the online GTF module and/or the module's VCXO.

  The Red LED may blink once per second for several seconds at start up.



2.2 Output Configuration

The module provides two sets of four output signals at a frequency indicated in the following table.

Output Configurations				
Dash Number	Channel	Frequency	Waveform	Output Level
-01	1	10 MHz	Sinusoidal	13 dBm
	2	5 MHz	Sinusoidal	
	3	1 MHz	Sinusoidal	
	4	1 PPS	2 ms pulse	TTL

2.3 Status

The status of the Phase Aligned Multiple Sine Wave Output Module can be obtained from the GTF module SSTA message or viewed from the Front Panel display (Menu 8). The status message consists of an identification number (first byte) in hex format and a bus status message (second byte).

2.3.1 Status Message

Dash Number	ID	Status
-01	0x74	Bit7=Synchronization Fault Bit6=Frequency In Fault Bit5=Osc. End of Life Fault, indicates the control voltage to the oscillator is out of useable range.

2.3.2 Front Panel Display (Example)

```
Slot 5  Aligned 1PPS/1,5,10MHz Sine 0x74 ≡
Status: 0x00 No Faults
```

2.3.3 Commands

Command: $PHAC,S*<cr|lf>

Response: $PHAC,S,E,P,V,sp*<cs|cr|lf>

Description: Reads Calibration variables of a Phase Aligned Output Module in specific Cs2/GSync slot

Fields:	Symbol	Range	Description
	S	1-15	Output Module Slot Number
	E	0-1	0=Auto Adjust disabled, 1,2=not locked, 3=Locked
	P	0-255	Phase Adjust delay setting (1nS/step *)
	V	0.00-5.00	Phase Detect Voltage
	sp	0.00-5.00	Phase Alignment Set Point

Command: $PHAC,S,E,P,sp*<cr|lf>

Response: $PHAC,S,E,P,sp*<cs|cr|lf>

Description: Sets Calibration variables of a Phase Aligned Output Module in specific Cs2/GSync slot

Fields:	Symbol	Range	Description
	S	1-15	Output Module Slot Number
	E	0-1	0=Disable Auto Phase Adjust, 1=Enable
	P	0-255	Phase Adjust delay setting (1nS/step *)
	sp	0.00-5.00	Phase Alignment Set Point

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2.4 Specifications

The output rising edges are phase aligned within < 15 ns with the 1 PPS output module and synchronized to the 10 MHz signal generated by the system's online GTF module; therefore, the output signals have the same phase, accuracy and stability as the online GTF module's generated signal connected to the module through the system's passive backplane. (See CommSync II User's Manual (385-8000) or GSync User's Manual (391-8000) for accuracy and stability information on the GTF/DTF.)

Unless otherwise stated, the following specifications apply when the internal oscillator has been disciplined for at least 2 days.

Frequency ..... 1 PPS, 1 MHz, 5 MHz, 10 MHz
Number of Outputs ..... 1 each
Connector Type ..... BNC female

1 PPS Output Characteristics
- Wave Shape ..... Pulse
- Width ..... 20 µs ± 1 µs
- Synchronization ..... Rising edge on-time
- Output rising edge phase alignment with output 1 PPS ..... <15 ns
- Output Drive –TTL into 50 Ω
  - High Level ..... ≥ +4.0 VDC into 50 Ω load
  - Low Level ..... ≤ +0.2 VDC into 50 Ω load

1/5/10 MHz Output Characteristics
- Wave Shape ..... Sinusoid
- Amplitude into 50 Ω
  - 385-4081-01 ..... 13 +3, -1 dBm
- Harmonics ..... < -60 dBc
- Distortion ..... < -50 dBc
- Sine wave alignment ..... Rising edge of all output within 5 ns
- Coupling ..... AC

Source Impedance ..... 50 Ω nominal
Protection ..... Short circuit proof

Allan Variance (Based upon GTF OSC type):

	Rubidium GTF	OCXO GTF
1 Sec	< 3E-11	< 1E-11
10 Sec	< 1E-11	< 1E-11
100 Sec	< 3E-12	< 1E-10

Phase Noise (5 MHz Output) (typical):
- @ 1 Hz ..... < -90 dBc/Hz
- @ 10 Hz ..... < -105 dBc/Hz
- @ 100 Hz ..... < -125 dBc/Hz
- @ 1 kHz ..... < -135 dBc/Hz
- @ 10 kHz ..... < -145 dBc/Hz

Phase Noise (10 MHz Output) (typical):

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@ 1 Hz ..... < -85 dBc/Hz
@ 10 Hz ..... < -100 dBc/Hz
@ 100 Hz ..... < -120 dBc/Hz
@ 1 kHz ..... < -135 dBc/Hz
@ 10 kHz ..... < -145 dBc/Hz

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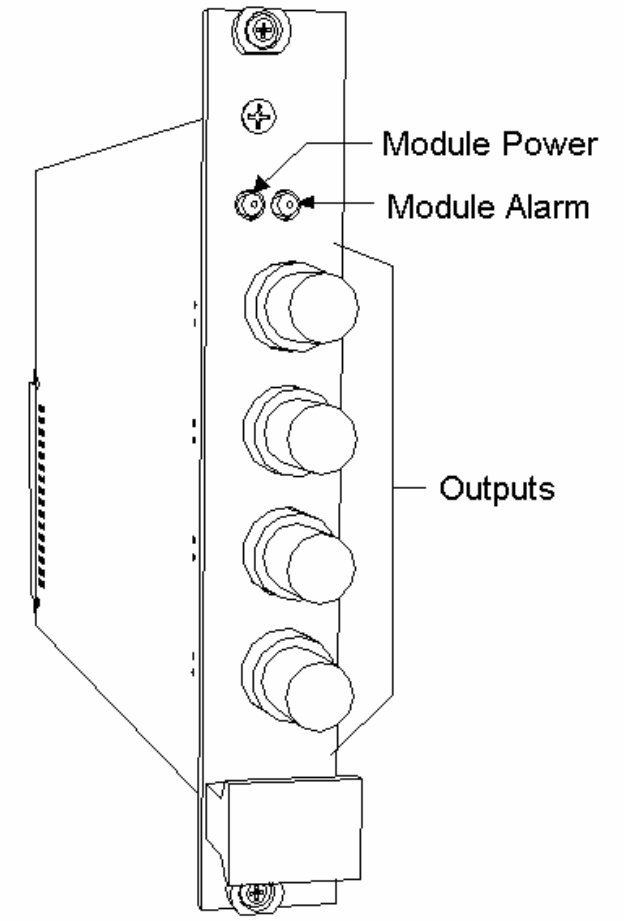
Phase aligned TTL Output Module 385-4083

The Phase aligned TTL Output Modules (385-4083) have two versions (**-01** & **-02**) **-01** is a Phase aligned 1 PPS TTL Output Module and **-02** is the 10 MHz TTL output module. Modules can be installed in any slot from 3 through 15. For GSync, the module may be installed in any of the four available slots. Each module is "hot swappable". It can be removed or installed without removing power from the CommSync II System or interrupting operations. Each module contains a VCXO and the necessary logic to minimize the effects of a fault induced switchover.



2.1 LED Status Indicators

The module's LEDs indicate the status of the module.

- The Green LED indicates power to the module.
- The Red LED is the Alarm indicator that illuminates when there is a fault in the reference signal from the online GTF module and/or the module's VCXO.

  The Red LED may blink once per second for several seconds at start up.

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2.2 Output Configuration

The module provides two sets of four output signals at a frequency indicated in the following table.

TABLE 1.4-1 MODULE CONFIGURATION		
DASH NUMBER	FREQUENCY OUTPUT	OUTPUT LEVEL
-01	1 PPS ALIGNED TTL OUTPUT	≥ +4.0V into 50 ohms load
-02	10 MHz PHASE ALIGNED TTL OUTPUT	≥ +4.0V into 50 ohms load

2.3 Status

The status of the Phase aligned 1 PPS/10 MHz TTL Output Modules can be obtained from the GTF module SSTA message or viewed from the Front Panel display (Menu 8). The status message consists of an identification number (first byte) in hex format and a bus status message (second byte).

2.3.1 Status Message

Dash Number	ID	Status
-01	0x76	Bit7=Synchronization Fault Bit6=Frequency In Fault Bit5=Osc. End of Life Fault, indicates the control voltage to the oscillator is out of useable range.
-02	0x75	

2.3.2 Front Panel Display (Example)

```
Slot 5  10 MHz Aligned TTL Output  0x75 ≡
Status: 0x00 No Faults
```

2.3.3 Commands

Command: $PHAC,S*<cr|lf>

Response: $PHAC,S,E,P,V,sp*<cs|cr|lf>

Description: Reads Calibration variables of a Phase Aligned Output Module in specific Cs2/GSync slot

Fields:	Symbol	Range	Description
S		1-15	Output Module Slot Number
E		0-1	0=Auto Adjust disabled, 1,2=not locked, 3=Locked
P		0-255	Phase Adjust delay setting (1nS/step *)
V		0.00-5.00	Phase Detect Voltage
sp		0.00-5.00	Phase Alignment Set Point

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Command: $PHAC,S,E,P,sp*<cr|lf>

Response: $PHAC,S,E,P,sp*<cs|cr|lf>

Description: Sets Calibration variables of a Phase Aligned Output Module in specific Cs2/GSync slot

Fields:	Symbol	Range	Description
	S	1-15	Output Module Slot Number
	E	0-1	0=Disable Auto Phase Adjust, 1=Enable
	P	0-255	Phase Adjust delay setting (1nS/step *)
	sp	0.00-5.00	Phase Alignment Set Point

2.4 Specifications

The output rising edges are phase aligned within < 15 ns with the 1 PPS output module and synchronized to the 10 MHz signal generated by the system's online GTF module; therefore, the output signals have the same accuracy and stability as the online GTF module's generated signal connected to the module through the system's passive backplane.(See CommSync II User's Manual (385-8000) or GSync User's Manual (391-8000) for accuracy and stability information on the GTF/DTF.)

Unless otherwise stated, the following specifications apply when the internal oscillator has been disciplined for at least 2 days.

385-4083-01(Phase Aligned 1 PPS Output Module)

Output.....1 PPS
Number of Outputs ..... 4 each
Connector Type .....BNC female
1 PPS Output Characteristics
Wave Shape ..... Pulse
Pulse Width..... 20 µs ± 1 µs
Synchronization..... Rising (leading) edge on-time
Output rising edge phase alignment with output 1 PPS ..... <15 ns
Output Drive –TTL into 50 Ω
High Level ..... ≥ +4.0 VDC into 50 Ω load
Low Level ..... ≤ +0.2 VDC into 50 Ω load

385-4083-02(Phase Aligned 10 MHz Output Module)

Output.....10 MHz
Number of Outputs ..... 4 each
Wave Shape .....Square wave,50 % ±3 % Duty Cycle
Output Drive –TTL into 50 Ω
High Level ..... ≥ +4.0 VDC into 50 Ω load
Low Level ..... ≤ +0.2 VDC into 50 Ω load

Accuracy ..... Locked to 10 MHz reference

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50 PPS Output Module 385-4033-05

The 50 PPS Output Module provides four 50 PPS ± 6Vdc outputs. The output interface is designed to be consistent with the DOD-STD-1399/section 441 for PTTI BCD outputs. This board is a compliment for the 385-4074 1PPS/1PPM/BCD Output Module

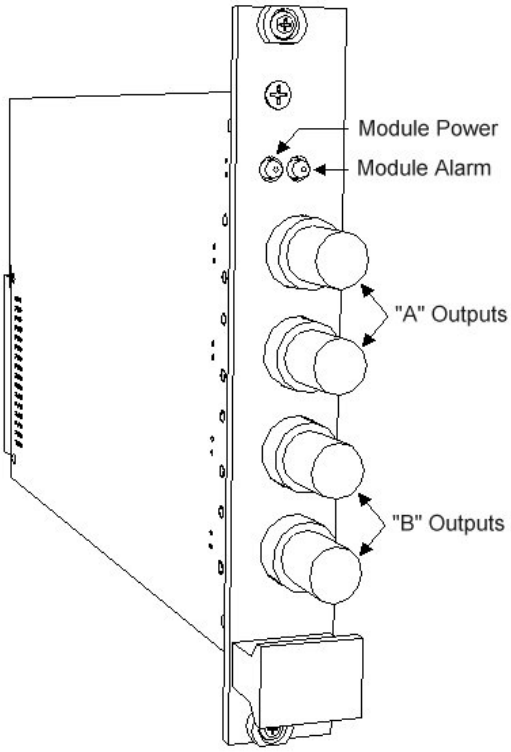
Note: This module is configured at the factory to provide 50 PPS, by the dipswitch on the module. The settings for 50 PPS are:1,3,4,& 6 off, 2,5,7,&8 on. Other dipswitch settings may produce undesirable results.

Modules can be installed in any slot from 3 through 15 (slots 1 through 4 in GSync). Each module is "hot swappable". It can be removed or installed without removing power from the CommSync II System or interrupting operations.

2.1 LED Status Indicators

The module's LEDs indicate the status of the module.

- The Green LED indicates power to the module.
- The Red LED is the Alarm indicator that illuminates when there is a fault in the 1 PPS reference signal from the online GTF module.



2.2 Output Configurations

The module provides four TTL level signals at a rate of 1 MHz through BNC connectors.

2.3 Status

The status of the 50 PPS Output Module can be obtained from the GTF module SSTA message or viewed from the Front Panel display (Menu 8). The status message consists of an identification number (first byte) in hex format and a bus status message (second byte).

2.3.1 Status Bits and Configuration Settings

ID	Status
0x61	Bit7 = 1 PPS or 10 MHz Input Fault (0=no fault) Bit6 = Output Synchronization Fault (0=no fault) Bits5,4,3 = A Output, bottom two outputs Bits2,1,0 = B Output, top two outputs
0x61	0x2D = Normal status, No Faults and both outputs set for 50PPS; Bit 7,6 = 0, No Faults, (0,0) Bits 5,3 = 1, bit 4 = 0 indicating configuration set for 50PPS (1,0,1) Bits 2,0 = 1, bit 2 = 0, indicating configuration set for 50PPS (1,0,1)

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2.3.2 Front Panel Display (Example)

```
Slot 3  Pulse Rate Output          0x61 ≡
Status: 0x2D
```

2.3.3 Commands

There are no commands specific to this output module.

2.4 Specifications

The output signals are synchronized to the 1 PPS generated by the online GTF module; therefore, the output signals have the same accuracy and stability as the online GTF module's generated signal connected to the module through the system's passive backplane.

Number of Outputs	4
Connector Type	BNC female
Rate	50 Hz
Duty Cycle	50% duty cycle
Synchronization Reference	UTC
Accuracy	Aligned to 1 PPS < 100 μS from leading edge
Levels	Logic One: +6.0 ±1 VDC
	Logic Zero: -6.0 ±1 VDC
Protection	Short circuit proof

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